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Steam and its Condensation. By THOMAS PROSSER, C. E.

CHAPTER V.

(Continued from page 223.)

Some Practical Suggestions on the Philosophy of Surface Condensation.

Although the promise of great saving of fuel and increased durability of boilers, has not been realized by Hall's invention* of a surface condenser, the cause does not appear to have been sufficiently investigated. One writer† attributes it to being "extremely difficult to keep it tight," which is purely imaginary and entirely at variance with every reliable authority.‡ The error probably arose from the saltiness of the water in the boilers, occasioned, not by leakage through the glands around the tubes of the condensers, but from the pumping of sea-water into them, to save the trouble of attending to the evaporator, as Mr. Hall himself states in his pamphlet, was done while he was on board, and which was only discovered by accident.

Engineers, like other people, are very apt to adopt the easiest method of supplying an immediate want, and the use of the evaporator implies the necessity of blowing off the residuum when a certain amount

* Bourne on the Steam Engine, page 64, says, "the weight and expense are formidable objections, and it does not act as a preservative of the iron of the boiler from corrosion." One vessel, he says, had 22 miles of copper pipes for the condensation of the steam.

† Note Journal of the Franklin Institute, Vol. xxi, (3d Series,) page 141.

‡ See London Mechanic's Magazine, Vol. xxxiii, page 46, and Vol. xxxvii, page 471, where the *Megæra's* condensers are reported to be in good condition after four years use, during the last three of which they had never been opened for inspection.

of concentration is arrived at, just the same as in any other boiler, the only difference being, that the scale is much softer, and therefore more easily removed.

Another objection was to the oil, grease, and other filth, which choked up the numerous small tubes, so as to require a plentiful supply of potash and hot water, and considerable poking with a stick into seven thousand ½ inch pipes, having an aggregate length of 14 miles, that being the complement of the *British Queen's* condensers.* In consequence of the coldness of the condensing water, this filth stuck with extraordinary tenacity, and the enormous quantity of cold water required for condensation, rendered an extra cold water pump necessary, while the feed water was reduced to 22° C., even after passing around the chimney.

In the sequel, I shall endeavor to show that the defect of the system, lay wholly in the low temperature of the working steam and of the condenser, and that nothing more than an increase of both was necessary to more economic action, equal in every respect to that assigned to Pirsson's method.

That Hall's condensation was almost perfect, does not admit of a doubt, and therefore it is entitled to rank as the first of its class, and has a value far beyond all others for comparison; in fact, it is the only one affording any fixed data upon which to found calculations of what may be expected under other circumstances.

Mr. Hall then allowed 2800 square inches of surface for the condensation of 60,000 cubic inches of steam per minute, at the pressure of 4 lbs. per square inch above the pressure of the atmosphere; and he employed 100 lbs. of condensing water on the outside of fifty thin copper tubes, each 3 feet long and ½ inch inside diameter, to do it with, and called that equal one H. P.† In other words, he allowed per H. P. 19 feet 5 inches of surface for the condensation of 1·6 lbs. of steam with 100 lbs. of water per minute.

In Chapter III, Table I, I have adopted for data, the workings of the "*Wilberforce*" steamer as furnished by Tredgold, (page 385,) so far as I can do so; but, inasmuch as the steam was used expansively for nearly half the length of the stroke, I have applied some of the data previously given for full steam, as I consider that the only proper basis for calculations of this kind.‡

It will be convenient to omit in our calculations, for the present, as much of the condensing surface as the evaporator may be supposed to require, for, although I have no doubt that it was used when the best results were obtained under Mr. Hall's system, it appears to have been abandoned at an early period; and in the case of Pirsson's system, it forms an entirely separate part, on paper, for it has never obtained general, if any, acceptance in practice. In my system, on the

* London Mech. Mag., Vol. xxxii, page 763.

† Repertory of Arts, Vol. iii, (4th Series,) page 78.

‡ The "*Wilberforce*" had 17·4 feet of surface for condensation, and employed 80 lbs. of condensing water, and as the steam contained 640° C. of total heat, and the condenser was at 15° C., there had disappeared 625° C. which had gone into the condensing water, and as that acquired but 9° C., it follows that the feed-water was about 1·16 lbs., or 1-69th of the condensing water. This shows pretty conclusively that Mr. Hall's calculation for full steam is as correct as can be expected.

contrary, although separate and distinct from the main condenser, not only is it inseparable in practice, but a heater also forms a necessary part in the arrangement.

We will therefore assume that instead of 19 feet 5 inches, 16 feet of area of surface is sufficient for the condensation of the steam necessary to furnish one H. P.

Before proceeding in this matter, it may be advisable to lay down a few succinct dogmas or *principal conditions* which *govern* CONDENSATION in *surface condensers of steam engines*, with regard to the amount of surface required. The amount of *heat*, then, which water will absorb in equal times, is in accordance with the following *conditions:*

1st. The greater the condensing surface,

2d. The greater the difference between the average temperatures of the steam entering the cylinder and condenser, and the condensing water entering and leaving the condenser,

3d. The higher the average temperature of the condensing water,

4th. The less the difference between the total heat entering the cylinder and leaving the condenser,

The greater is the amount of condensation, and a mere inspection of the Table I, Chapter III, will show that every one of these *conditions* is greatly in favor of a general high temperature.

We will therefore proceed to eliminate them with the view of obtaining the condensing surface necessary under each system, to condense the same weight of steam, assuming that Hall's, as the standard, requires 16 feet.

Thus we have, $8{\cdot}1021=16$, $(\frac{48{\cdot}5}{62{\cdot}0}, \frac{142}{212}, \frac{596{\cdot}1}{616{\cdot}8})$;
and, $3{\cdot}5760=16$, $(\frac{48{\cdot}5}{89{\cdot}0}, \frac{142}{314}, \frac{569{\cdot}4}{616{\cdot}8})$.

In round numbers therefore, Require respectively,	Hall,	Pirsson,	Prosser,
of condensing surface per H. P.	16 ft.	8 ft.	3·5 ft.
And of condensing water,	69 lbs.	13·5 lbs.	4·13 lbs.

The condensing water absolutely required by Hall and Pirsson greatly exceeds these amounts, by the amount of condensation in the cylinder, less that portion of it which is produced by external radiation. Hall's and Pirsson's condensing surfaces, it must be remembered, are required only for condensing the working steam, and not to make up for the boiler waste. To make mine comparable with them, will require but $2{\cdot}8'=3{\cdot}5\times{\cdot}8$; because my heater really forms a part of my condenser, as will be better understood by referring to my article "On the Power of Steam,"* where I allow $3{\cdot}75'$ per H. P.

A few words are also necessary in explanation of the small quantity of water (4·13 lbs.) required for condensation. It would be 5·9 lbs. but for the fact, that ·3 of the steam is merely transferred to the water in the hot-well, and is allowed to escape as steam uncondensed, as is explained more fully in another article on "Steam and its Condensation."†

Still there is difficulty in comparing the other two systems with

* Journal of the Franklin Institute, Vol. xxxvi, (3d Series), page 11. † Ibid. page 89.

mine, on account of their great dissimilarity in apparatus and principle of action in all that constitutes a condensing engine; and yet, I have been asked disparagingly, in what respect my condenser differs from any other? Says one, you *only* omit the air pump! another, you *only* condense with boiling hot water!!—and yet another, you *only* evaporate from the hot-well instead of a boiler!!!

Are not these enough? Look at the resulting consequences, and many more *onlys* will have to be added to the list before all the differences are run down: for instance,

The boiler surface required is *only* reduced from 30 to 6·4 feet.
The coal consumed per hour per H. P. is *only* reduced from 10 to 3·2 lbs.
The condensing surface required is *only* reduced from 16 to 2·24 feet.
The condensing water required is *only* reduced from 110 to 4·167 lbs.

And the weight of steam per minute per H. P. is only reduced from 1·6 to 1·00 lbs.

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CHAPTER VI.

On the Power and other Mechanical Properties of Steam.

The "absolute mechanical power" of steam is shown in my Table before referred to* column 8. This column is the product of the pressure (column 3,) multiplied into the expanded volumes (column 7,) which *must* give the whole mechanical power in the steam beyond dispute. But there is one thing remarkable which I believe has not before been observed. It is this, for every degree (C.) of heat added to the temperature, there is an increase of mechanical power equal to one pound raised 154·40222 feet; for it will be perceived that, for each decade of °C. of the Table, (column 8,) there is a constant and uniform increase of 1544 feet, notwithstanding the chaotic appearances of the increments of column 3, and the decrements of column 7. And therefore the formula of Regnault† ($\lambda = 606{\cdot}5 + {\cdot}305\ t$,) which represents the total heat in the steam is of precisely the same structure as one representing its total mechanical power ($\lambda = 42071 + 154{\cdot}40222\ t$,) and also the rate of absorption of heat by water ($\lambda = 100 + {\cdot}4\ t$). Thus connecting these three great physical facts with each other by simple constant arithmetical increments. Could we but connect the temperature, density, and pressure of steam in a similar manner a far greater achievement would be accomplished.

But there is yet another still more remarkable coincidence which I have also discovered, between the laws of development of mechanical power by the conversion of water into steam, and the law of gaseous expansion by heat. Both these laws are in the simple ratio of arithmetical increments, and are identical with each other.

Referring again to my article "On the Absolute Mechanical Power in Steam,"* I would observe, that, column 8 was not calculated by multiplying column 3 by column 7, as may be supposed from the note to page 7, but each value was calculated by the formula $\frac{p}{t+272{\cdot}47905}$‡ as given at p. 5, and that accounts for the discrepancies in some of the

* Journal of the Franklin Institute, Vol. xxxvi, (Third Series,) p. 7.
† Memoirs l'Academie de France, Vol. xxi, page 727. ‡ Ibid. page 119.

units of value. It is of course easy now to see why it should be so, but the calculations were made before the fact was observed, that column 8 was composed of the products of columns 3 and 7, and it was still some time after that before it was discovered that the increment for each degree was a constant quantity, and still more recently that I discovered that *the same number of degrees which will double the mechanical power of air from 0° C. while its elasticity remains the same, will also double the mechanical power of steam, in its conversion from water of the same temperature and under the same tension.* The mechanical power in steam converted from water at 0° C., is stated in column 8 to be equal one pound raised 42071 feet, and as the increment for each °C. is, as before stated, 154·40222, it follows that (42071÷154·40222=) 274·479° increase of temperature will double the mechanical power as stated.

From this digression I return to the absolute mechanical power developed during the conversion of one pound of water into steam at the respective temperatures of 106° C., 130° C., 180° C., and applied to the three systems of

	Hall,	Pirsson,	Prosser.
One pound raised in feet,	58438	62144	69864
Total steam pressure at entering the cylinder per square inch,	18 lbs.	39 lbs.	146 lbs.
Back pressure on the piston,	4	5	20
Unbalanced steam pressure,	14	34	126
Per centage of power applied in power developed,	·82	·90	·98

The last line being equivalent to deducting 18, 10, and 2 per cent. for condensation in the cylinder, *omitting* all consideration of the *extra* power necessary to work the air and cold water pumps, with (it is believed) all other debatable matter.

Taking Hall again, as the standard of power *developed*, and allowing, as he did, 1·6 lbs. of steam equivalent to one H. P., we have for the power developed by one pound of steam,

lbs. raised 1 ft.

$$58438 \times \tfrac{14}{18} \times \cdot 82 = 37275 \text{ by Hall.}$$
$$62144 \times \tfrac{34}{39} \times \cdot 90 = 48759 \text{ " Pirsson.}$$
$$69864 \times \tfrac{126}{146} \times \cdot 98 = 59087 \text{ " Prosser.}$$

	Hall.	Pirsson.	Prosser.
And for the weight of steam per minute per H. P.	1·6	1·223	1·009 lbs.

It appears to me very plain now, that Hall's condenser died of the same complaint as one of Shakspeare's heroines, "too much of water hast thou, poor Ophelia."

The proportions of boiler and condenser surface, as well as of fuel and condensing water, will, of course, be decreased in proportion to the feed water required, therefore making the necessary correction we have,

			Hall,	Pirsson,	Prosser,
Boiler surface required per H. P.,		feet,	30	20	6·4
Coal per hour	"	lbs.,	10	6·4	3·2
Condensing surface	"	feet,	16	6·4	2·24
Condensing water,	"	lbs.,	110	16	4
Feed water per minute	"	lbs.,	1·6	1·223	1·00

These enormous gains will create no surprise in those who have well studied the subject of heat, for the best physicists maintain that not more than from $\frac{1}{8}$ to $\frac{1}{6}$ of the whole heat developed in the furnace of the boiler, is ever converted into effective mechanical power where the vacuum condenser is used, which washes the *life* out of the steam in a flood of cold water.

I will conclude this Chapter by stating some broad and fundamental differences between my system and all others, and first as to

The Low Pressure Condensing Engine.

Must have an air pump.	Mine must *not* have an air pump.
Condenser must be cool.	My condenser must be hot.
Must be below the boiling point.	Mine must be above the boiling point.
Does not admit of vapor from condensation from the hot-well.	Admits of vapor for condensation from the hot-well.
Reduces the temperature of the steam under the delusion that it is possible to use the power obtainable therefrom, and yet not cost more to restore it than that power is worth.	I reduce the temperature of the steam only so much as is necessary to bring the water under control.

And, Secondly, whether Condensing or Non-condensing.

Their excellence depends on keeping down the back pressure on the piston.	Mine depends on keeping it up.
Must regulate the steam to the load on the engine by the increased or decreased pressure of the *working steam* upon the piston.	Mine is more economically regulated by decreasing or increasing the *back pressure* on the piston.
The Noisy System.	The Quiet System.

Russian Inland Navigation.

(Continued from page 232.)

II.—*Artificial Systems of Navigation of the West of Russia.*

In the west of Russia the river Dnieper is united artificially with the western Dwina, the Niemen, and the Vistula, by means of the canals of Berezina, Oguisk, and the Royal Jolith Canal.

Canal of Berezina, between the Berezina and Oulla rivers.

This communication was begun in 1797, and the first floats of timber passed through it in 1805.

A canal of junction, 5 miles and 550 feet long, has been dug between the lakes Plavia and Bereschta.

From the Plavia lake, toward the Berezina river, the route passes through the Manetz lake, and by the Sagolla river; from the Bereschta lake to the Oulla river, it follows the small river of Beretcha and Esse, and traverses lake Gessaie, from which the Oulla derives its source.

The most difficult points for navigation on the Sergout and the Bereschta, as well as the mouth of the inlet to lake Gessaie and the outlet from it of the Oulla river, *are passed by means of independent canals*

along the river banks, and a canal of the same kind has been dug for the improvements of the Oulla, near the town of Tchachmiki.

The aggregate length of these canals for re-placing the channels of the streams is 8⅓ miles, and the entire distance, from the confluence of the Sergout and the Berezina, to that of the Oulla with the western Dwina, is about 98⅔ miles.

For this distance navigation is effected by means *of locks of wood* about 140 feet long and 30 feet broad.

The lock at the extremity near the Berezina has been built near the mouth of the Sergout, and the last lock on the Oulla is 30⅔ miles near its mouth, on the canal of Tchachmiki, which replaces the river channel further up.

The object of the Berezina canal is to transport the timber of the government of Minsk towards the Western Dwina. This object has been effectually accomplished, for there are annually passed by this canal towards the Dwina and down the latter stream to Riga, timber for masts and for other purposes, valued at $562,500.

At the same time there is transported on these floats a certain amount of other cargoes, consisting of the products of the soil, but there does not exist as yet a trade by water between the Dnieper and the Western Dwina, and vice versa, by the route of the Berezina canal. If, in consequence of a future increase of industry, the necessity of such a navigation should be felt, the Berezina system would need much improvement, not only on the Berezina and Sergout rivers, but also on the Summit level canal itself, at the Manetz and Plavia lakes.

The Oghuisk Canal, built between the Yatzalda, which falls into the Bripaik, and the Stehara, which is a tributary of the Niemen, had already been began by the Polish government in 1770; and the works having been suspended, they were again resumed in 1779, by order of the Emperor Paul the First. The canal was first navigated in 1804.

The Summit Level canal, dug for a length of 32 miles, begins at the Yatzdda, and passing the lakes Voulka and Vigonostche, terminates at the Itchara.

The Vigonostche lake forms the dividing point at the canal. *The locks are of wood*, and admit the passage of boats 84 feet long and 14 feet broad, with a draft of water equal to three feet.

The sinuosities of the channel of the Itchara, which most obstruct the navigation, for a distance of 78⅔ miles from the mouth of the Oghuisk canal to the City of Slomini, have been improved by means of independent canals along the river. In order to raise the level of the water, at places where the river is not sufficiently deep, five dams, with flood gates, have been built with *wooden* abutments.

On the lower part of the Itchara, from Slomini to the Niemen, retaining dikes have been built in various places, and the channel has in several places been straightened and improved.

The navigation on the Oghuisk canal is principally toward the Niemen. The principal articles carried are timber and the local products of the soil of the government of Minsk and Volhynia. About 50 boats and 2300 floats of timber annually pass through this canal.

The improvement of the navigation of the Itchara did not constitute a part of the original product for the Oghuisk canal, but was made subsequently, and there still remain some unexecuted projects for the further improvement of the stream.

The construction of the *Royal Canal*, between the Pina, which falls into the Yatzdda, and the Bug, which empties in the Marie, had been begun under the reign of Stanislas Augustus, King of Poland, but at that epoch the only work finished was the excavation of a large ravine between the sources of the Pina and Moukhavitz rivers. This ravine, filled with water in the spring, permitted the passage, during a very short period, of some floats of timber and a few boats, of a light draft, from Pinsk to Brest-Sitovsk.

The Russian government, hoping, by the construction of a regular water communication, to convert the Royal canal into a very useful channel, in a strategical point of view, and one at the same time very advantageous for developing the industry of the vast region, of which Pinsk is the centre, has often had under consideration the propriety of finishing the work already begun upon the route, but owing to various causes this idea remained unexecuted until the year 1837, when the projects prepared for the completion of the Royal canal were confirmed, and by order of his Imperial Majesty, the necessary funds were set apart for completing the work.

The projects for establishing the Royal canal were drawn up according to two different ideas; first, the opening of the navigation on the upper part of the Pina river by the canal joining this river with the Moukhavitz, and improving the navigation of the latter by means of locks; and second, the improvement of the navigation without the aid of locks.

The first of these projects would require the collection, on the summit level, of a mass of water in reservoirs much less considerable than the second, but as researches on this subject demonstrate the possibility of borrowing, annually, from the lakes situated near the Summit Level canal, nearly 137,200,000 cubic feet of water, and as, moreover, it has been found practicable to divert into these same lakes the head waters of the Pripait and the Towra; the second project has been chosen, on condition, nevertheless, that in case of extraordinary droughts, which, however, according to the statement of the inhabitants of the country, occur very rarely, there are to be built, at the two ends of the canal, temporary dams, *giving the means of feeding with the summit waters, alternately*, the Pina and the Moukhavitz, and to cause boats to pass in caravans or fleets, *as is practised on the Vishney Volotchok canal.*

The second project is to be preferred to the first for another reason, viz: that in constructing the Royal canal without locks, it becomes necessary to enlarge all the feeders leading into the canal, and in this way the feeders themselves are converted into navigable canals; so that, at very little cost, there is established near the Royal canal, a net work of navigable communications, contributing not only to the drainage of the vast morasses of this country, but also to the develop-

ment of agriculture and industry. Even supposing it to be necessary, notwithstanding these calculations, to construct a few locks on the upper portions of the Pina and Moukhavitz rivers, this should not cause the least modification in the plans of the canal and feeders.

The Summit Level canal, between the Pina and the Moukhavitz, is 35⅔ miles in length. On the upper parts of those streams, where the navigation is difficult in consequence of the shallowness and crookedness of the channel, canals have been built parallel with the stream. Navigable feeders unite the Royal canal with the lakes Belojai and Oraikhoffsxajai, as well as with the upper parts of the Pripait river, and other lakes contiguous to this stream. The total length of the canal feeders is 99¼ miles.

The whole distance from the mouth of the Pina, on the Yatzolda, near Pinsk, to the confluence of the Moukhavitz and Boug, at Brstt-Gitovsk, is 144¾ miles; of this distance the Pina occupies 34½ miles; the Independent canal, on the upper part of the Moukhavitz, ⅔ of a mile, and the Moukhavitz itself, 62 miles.

All the work on the Summit Level canal and on the canals along the river, and also the feeders, were finished in 1842, and all the remaining work, including the improvement of the channels of the Pina and Moukhavitz proper, has since been completed.

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III.—*Improvement of River Navigations.*

Volga River.—On all its courses from Rybinsk to Astrachan, the navigation of this stream is obstructed by very few difficulties, but in ascending above Rybinsk towards Tver, and still higher as far as the source, the channel of the river is encumbered with rocky bars and sand banks. Notwithstanding that by the course of the Volga it is only 250 miles from Rybinsk to Tver, yet it took, in dry seasons, not less than six weeks to make this trip, with a draft of water of from 14 to 18 inches.

This state of things exactly in that part of the Volga which leads from Rybinsk to the Vishney Volotchok system, caused great injuries to this avenue of trade for the productions of the interior of Russia destined for exportation, and by which also the capital is supplied with the greater part of its provision and articles of consumption. The government accordingly resolved to have recourse to artificial means for deepening the channel of the river on this part of its course.

The following measures were relied upon for effecting the end in view. *Dikes*, confining the channel within narrower limits, were to be erected, *the effect of which would be to deepen, and at the same time straighten the channel.* The second resource consists in the establishment *of a reservoir* on the upper part of the Volga, *the special object of which is to feed that stream during the summer months.* The construction of the retaining dikes was begun in 1837, and in 1841 a dam with flood gates, &c., was begun in the bed of the river so as to form *a reservoir* above it in the lakes Volga, Paino, Visslouga and Stairga.

The dikes, by confining the channel within narrower limits, increased its force and tended to remove the deposits of earth in those parts where the stream is not obstructed by them, and in this way they have already produced a very useful effect, by deepening the greater portion of the bars which formerly obstructed the Volga between Rybinsk and Tver. *The reservoir* was designed with a view to its accumulating annually, at the outlet gates, a sheet of water 16½ feet deep, which is equivalent to holding in reserve 10,976,000,000 cubic feet of water during the spring floods, *to be subsequently used in filling the channel during the times of the passage of the fleets of arks.*

By these means it is hoped that the inconveniences heretofore experienced in navigating the Volga, between Rybinsk and Tver, may be obviated to such an extent that boats and arks, drawing from 24 to 26 inches of water, may ascend the stream between these points in about 20 days.

Experience has shown that the water permitted to flow in the Tvertza river from the Zavodsk reservoir, increased the depth of the channel not only in the Tvertza, but in the Volga also, for a considerable distance from the mouth of the Tvertza, and even as far as Rybinsk, when the quantity permitted to flow from the reservoir is very considerable. If we take into consideration, that the supply from the reservoir of the Upper Volga, may be five times as great as that which is drawn from the Zavodsk reservoir, during the periods when the Mstino sluice is closed, for the purpose of raising the water in the Tvertza river, we can hardly fail to be satisfied that the channel of the Volga, particularly after it has been straightened and improved, will be deepened very materially by the Upper Volga reservoir.

Timber being very abundant on the head waters of the Volga, *the whole of the constructions about the dam, waste-weirs and flood-gates of the reservoirs are of that material.* The sluices have five openings, permitting the passage of a stream of water 142 feet broad.

The Dnieper River.—A little below the City of Ekatermoslav, the course of the Dnieper is obstructed by cataracts which only permit a descending navigation, and not even this, except during the spring and autumn floods.

The cataracts of the Dnieper extend for 43½ miles. There are nine principal falls where even the descending navigation is exposed to considerable danger and eight rocky bars.

The government has for a long period been endeavoring to improve the navigation at these cataracts, and as far back as 1807 a lock was built at the Nainasytchik fall, which is the most dangerous of them all.

Neither this lock, however, nor the other works constructed at the same period, afforded the necessary aids to the navigation, and a careful study of the other measures to be taken, continued until 1833.

Independently of this, the affair of the improvement of the navigation at the Dnieper cataracts, was at the same time considered under a more general view, and in order that time should be afforded for them to make general investigations, His Imperial Majesty directed

that, for the moment, no partial efforts should be made to create an ascending navigation, but that all the measures adopted should be limited to the means necessary to facilitate the descending navigation throughout the summer.

The project prepared with this object contemplates the cleaning out of the channel at all the bars, and establishing at each one of the nine cataracts, above mentioned, in the bed of the stream, in the direction of the main current, a canal sufficiently deep to admit of the passage of boats; *a dike of stone being at the same time raised on each side of this canal to protect the boats from the effects of side winds;* and the channel of the river above and below the canals being straightened and improved.

In accordance with this project, the canal at the fall of Starakaidatsk was finished in 1837, this fall being the first encountered in descending the stream. The effect *completely answered the expectations*, and since then, down to the present period, the same operations have been continued at the eight other falls. These works are now completed, and at present there is under consideration a project for additional ones by means of which to render practicable an ascending navigation, and thus fully accomplish the purpose in view.

The River Tzna.—Navigation on the Tzna from the city of Moschansk, is only passable during the spring. During this short period 500 arks, carrying about 1,500,000 sacks of grain, annually descend this river. Having taken their cargoes to Rybinsk the arks return empty to the mouth of the Tzna, and habitually ascend it to the points where their cargoes for the succeeding spring are accumulating. This ascent of the empty arks is effected every year in the fall, and at this time only by the aid of the water which is suffered to flow simultaneously from out the mill dams erected on or near the Tzna.

Cargoes on the Tzna are carried in preference on arks of large dimensions, such, for example, as those of Mokshany and Gouniduki, carrying from 480 to 720 tons.

The navigation on the Tzna, in its natural state, is, during some seasons, much impeded in consequence of the shallowness and crookedness of the channel, and the want of the water derived from the mill ponds. This circumstance has constantly kept alive the solicitude of the government on the subject, and caused it to have recourse to artificial means for its improvement.

During the years 1836 and 1837 the subject was investigated for the purpose of establishing on the Tzna a system of locks from Movshansk to the confluence with the Mokscha as well as above Movshansk to Tamboff.

The question having been discussed, *it became fully evident that the construction of locks would not in the least correspond with the wants of the trade* in grain of this district, and that the measures to be taken should be limited to the amelioration of the descending navigation during the spring.

With this view a canal six miles long was dug in the valley of the Tzna during the years 1839 and 1840. This canal commenced a little

below Movshansk and extends between the villages of Moscetaspiro and Geravo, for the purpose of avoiding the sinuosities and obstructions of the channel, which, experience has shown to be most injurious. At the same time with this, there were several other improvements effected in the bed of the stream. These measures have had so beneficial an effect on the navigation that the number of arks leaving Movshansk and its environs have begun to increase, whereas formerly the number had been limited, in consequence of the dangers and retardations to which the traffic was subjected, to such an extent, that it occasionally happened that the arks could not get out of the river at all, and were obliged to lose the season.

The Western Dwina.—The strong bars on this stream, which impeded the navigation during low water, have been cleared out. In addition to this, the right bank of the stream near the fortress of Dinaburg, has been riveted with facines and raised by means of embankments, with the requisite hydrotechnical constructions, the object of the whole being to protect the fortress from inundation.

At the city of Riga there have been constructed in the bed of the river, as an experiment, *dikes for the purpose of narrowing the channel.* These dikes have been built of various dimensions, and in different ways, and various directions have been given to them, for the purpose of determining, by experience, the best means for improving and deepening the channel.

The River Neva.—This river, from its outlet from lake Ladoga to its mouth in the Gulf of Finland, has every where a depth sufficient for fully loaded boats, except at certain places in the neighborhood of Rehla, where isolated rocks and stony bars require that the channel should be cleared out. This has accordingly been done, and at present the navigation is carried on without difficulty.

Tow-paths have been built along the river banks to facilitate the towing of the boats which ascend the river.

The River Siass, belonging to the Tykhvine system, is shallow and has a rapid current. The greatest obstacle to the navigation is the fall of Geitz. At this place the river has been improved by the construction of a lock with a chamber, *connected with which is a dam, which is removed every fall.* The supports of this dam rest in cast iron sockets let into the rocky bottom of the stream, and *the whole being taken away at the close of navigation*, the ice during the spring and fall can pass off freely on the whole breadth of the river.

Artificial tow-paths have been constructed on the Siass, at the points where difficulties are encountered in consequence of the crookedness of the channel and the rapidity of the current.

The River of Soukhona.—The first few miles of this stream, after it issues from lake Konbensk, offer many difficulties for the navigation, and it occasionally happened, during very dry seasons, that it was entirely interrupted. The establishment of a lock on the canal along the stream, and of retaining dikes in the bed of the river, have not only removed these difficulties, but have, at the same time, secured the additional advantage of raising the level of the water in the Konbensk

lake, and increasing the depth of the channel on the shoals which obstructed the mouth of the Tovosovitz, a navigable tributary of this lake, belonging to the system of the canal of the Duke Alexander of Wurtemburg.

The Volkhoff River.—The rapids of Ptchefsk have been cleared out, where boats navigating the Ladoga canal, coming from the system of Vishney Volotchock, encountered obstacles arising from the shallowness of the water and the existence of detached rocks on the bottom of the river. It became occasionally necessary to lighten the boats in the fleets, to 24 or 26 inches of draft. To obviate similar inconveniences encountered on the same river, and particularly at the Volkhoff rapids, *movable dams have been employed, for the purpose of temporarily raising the level of the water.* In this way, at the least possible cost, means have been found for avoiding the much more heavy expense which the permanent improvement of the Volkhoff river would necessarily have imposed.

Goryne River.—This stream, which is one of the navigable affluents of the Pripait, has been considerably improved by the establishment of *three wooden locks.* The necessary precautions have been taken by the ministry of public works to prevent these locks from being injured by the spring floods.

Sveet River.—On this river, which joins the Ladoga and Onega lakes, there are several rapids, but the channel is almost every where deep enough, even during the low stages, for the passage of boats coming from the Marie system of navigation.

No other inconveniences are met with on the Sveet, than some very short turns in the river. These crooked channels were obstructed with detached masses of rock, but the largest of them, which were under the water, have been blown to pieces by gunpowder, and the others have been cleared away, during the lowest stages of the stream. For the reason that the decked boats on the Marie system return from St. Petersburg to the interior, tow-paths have been made along the banks of the Sveet, wherever there are rapids, so as to facilitate the ascent of the stream.

Sheksna River.—Similar tow-paths have been built in several places along the banks of the Sheksna, particularly at the Boroivmovsk rapids, where, in consequence of the velocity of the current, forty horses are scarcely sufficient to tow a single boat.

Finally, among the measures taken for facilitating navigation, must be enumerated the construction, on Ladoga lake, of four light-houses, for pointing out the way between the mouths of the Sveet, the Siass, and the Volkhoff, and the outlet of the Neva.

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*The Panama Railway.** By V. Wyatt, C. E.

There are but few public undertakings which have so much interest attached to them as the Panama Railway; connecting as it does the two large oceans of the world—the Pacific and the Atlantic—and tra-

* From the Lond. Civ. Eng. and Arch. Journal, Jan., 1859.

versing the backbone of an isthmus which hitherto had been deemed insurmountable; passing to and fro the commerce of the eastern and western parts of the world, and opening up the riches and glories of the Pacific,—this railway bids fair to assume great commercial and general importance. India, Australia, California, British Columbia, and the rich provinces of Central and South America, on the Pacific side, have had a new and direct overland route opened to them by the construction of this isthmus railway.

A casual inspection of the American isthmus and the demands of commerce would seem to dictate that a canal between the two oceans, by which the shipping of the two seas could be interchanged without breaking bulk, would have been a far more useful and commendable work than a railway. So natural is this conclusion, that from time to time various and diversified have been the projects for a ship canal between the two seas, and these projects date as far back as the Spanish Conquest. Shortly after Columbus had cruised about and discovered the Central American waters, and when the enterprising Spanish cavalier, Nunez de Balbao, had actually mounted the Andes, and espied, for the first time by a European, the Pacific Ocean, more than three centuries since,—the world became convinced of the necessity of some great work on the isthmus. There have been proposed from time to time, two different ship canals at Nicaragua—one with a Pacific terminus at San Juan del Tur, and another at Realejo in the Pacific, where the summit level in the former case is 615 feet above the sea, and in the latter about 212 feet. The latter route is somewhat circuitous and uncertain in its data. The Panama crossing of the isthmus has also been advocated, presenting equally favorable features for a canal as it does for a railway. There are no abrupt elevations and depressions; the distance can be made the shortest possible across the isthmus, being only about 30 miles in a straight line; and its greatest elevation above the mean level of the two oceans, by careful selection of country, need not exceed the highest point of the Panama Railway, which is only 263 feet, and this summit height being of very short continuance. Then there are the Darien and Atrato routes; the former of which is much controverted, and its assumed data are insufficiently supported by reliable surveys, the summit being stated by one exploring party to be all that the mind can desire, and by another and more recent exploration as beset with mountain ridges and insurmountable obstacles; the latter route (the Atrato,) has the objection of lockage up the rivers which descend from the summit each way, and it is very circuitous. There is no difficulty about the level of the two oceans, as the mean tide level of each are identical, the only difference being that the spring tides in the Atlantic are only about 18 inches, whereas in the Pacific they are from 10 feet at San Juan de Nicaragua, to about 18 feet at Panama Bay.

The climate of the coast of Central America and the isthmus of Panama, is of the most unhealthy character, and quite unfitted for Europeans. The atmosphere is hot, steamy, damp, miasmatic, and fever generating. The European when he lands on this coast, feels his en-

ergies relaxed, and his whole spirit depressed. This was the greatest difficulty the pioneers had to contend with in the construction of the Panama railway. The railway works were of a light character, and would have been deemed trivial in healthy spots; but when the theatre of operations was the isthmus of Panama, then the problem was, not merely to organize men for their work, but how to keep workmen alive in such a pestilential place, continually attacked as they were by intermittent fevers and agues. Every gang of men was being continually broken up by disease, desertion, and excessive mortality. It has been stated that 10,000 men lost their lives in the making of this railway, and that the sleepers in the line count the numbers of bodies buried there; but this calculation, like many other popular rumors, is of course over-estimated. It is very certain, however, that the company did import on to the isthmus during the time the works were going on more than 3000 Americans, Irish, Chinese, and Negroes, besides the casual supply of labor which found its way to the works from time to time. The major part of these men fell victims to the isthmus fevers; the Chinese committed suicide to a wholesale extent; many succumbed to their intemperance and irregularities under a tropical sun; and some, including many shrewd Americans, "cleared off," and departed from the isthmus as soon as the seeds of disease or the horrors of the spot became apparent to them. The inconveniences and risk of working in such a climate may be imagined from the fact that the temperature on the isthmus is from 82° in the morning to 90° mid-day Fah. in the shade, and this continued all the year round, with no greater variation than 5° or 6°; and accompanied with this is the unhealthy steam from a tropical rainy season extending over eight months in the year. The sea water in the two oceans adjacent to the isthmus, taken at ten feet below the surface, averages 84° Fahrenheit.

The Panama Railway starts on the Atlantic side from Navy Bay, at a point called by Europeans and New Granadians, Colon, and by the people of the United States, Aspinwall, after one of the railway promoters. Colon or Aspinwall town, which has been created by the railway, has a very backwoods-settler look about it, being composed of wooden houses, stores, shops, and hotels, and has only one permanent looking structure, viz., the railway freight and store-house, built of stone with an ordinary iron roof of 78 feet span. The American engineers point to this as the very *chef d'œuvre* of engineering. Aspinwall is on the eastern side of Navy Bay, on an almost submerged coral reef, standing only about three feet above the Atlantic. It is a wet, swampy, and aguish-looking spot; the rains are incessant; and yellowish-white unhealthy looking faces are visible everywhere amongst the railway employees and residents. Panama is considered a wet place, but in comparison with Colon or Aspinwall, it sinks into insignificance; the railway rain-gauge at the latter place showing a register in one rainy season of eight months, of 110 inches of rain. England is called wet with an average of 26 inches of rain for the year. Behind Aspinwall is a rotten swamp for miles, the miasma from which salutes the nostrils of the voyager when landing; and he is moreover

advisedly informed that a residence of more than twenty-four hours for a new comer, will probably introduce him to a tropical fever. The old outlet on the Atlantic side for the mule travel of the isthmus was at Chagres, situated to the west of Navy Bay, being at the mouth of the Chagres river; and a never-to-be forgotten place by Californian travelers, who have so often left the bones of their friends on its miserable shores.

The railway after leaving Aspinwall crosses the dismal swamp before alluded to for a distance of seven or eight miles ere it reaches terra-firma; it then escapes from this floating bog, with all its rotten, rank, tropical vegetation. The greatest amount of mortality resulted on this part of the line in the first construction; here not only from the unhealthfulness of the situation, but also from a total absence of any properly organized commissariat to supply the men with the necessary and proper comforts; and also allowing the free circulation on the works of the raw spirits so cheaply imported on to the isthmus from the West Indies. Various were the expedients adopted by the American engineers in this swamp to form a foundation for the road, and to economise labor, time, and expense. Crib-work (the American term for large wooden boxes, formed of large timber logs, which are loaded with stones or gravel and sunk into position), fragile and temporary trestle-work, and staging on piles. All these methods have rotted and nearly disappeared, as might be expected in a climate where the durability of timber is estimated by months instead of years; and this fragile and temporary work is being substituted, or rather buried up by a filling-in of good, hard, dry, rocky material, with occasional tips of clay to bind the whole together in one mass, enclosing in its bulk the original piled staging and crib-work; the material being obtained from side cutting on the Panama side of the swamp. There is one merit however in the swamp part of the railway, which is that it is the only direct and straight part of the line; most of the rest being very circuitous, and laid out in a succession of serpentine curves, on precipitous sidelong ground.

The clearing of the railway from bush and jungle was attended with considerable risk, having to be done two or three times over during the progress of the works, the growth of vegetation being so prolific here. Now that the line is completed and opened, the clearing is still a work of some expense, and has to be done twice a year by negroes, or the course of the line would be grown up and invisible. In the first attempts at clearing away the jungle, the pestilential insects were an insufferable nuisance to the men; and frequently have they been driven from their work before a cloud of mosquitoes, sand-flies, garropatas, and venomous tropical insects.

From the dismal swamp the railway winds its course tortuously, and in the shape of an almost succession of reversed curves, through the summit and all the way to Panama. These curves are reversed 4°, 6°, and 8°, (which is the American notation for curves of the respective radii of 1432, 955, and 716 feet,) without any straight line to ease the reversal, and not always with the outer rail elevated. The winding

course of the line may be conceived of from the fact that the isthmus in a direct line is only about 30 miles wide, but the distance by railway from Colon to Panama Bay is 48 miles. The course is very ingeniously picked out in the vicinity of the summit, taking every available ravine and opening to its assistance; running sidelong on the banks of the Chagres river in dangerous proximity for miles, and turning at times to every conceivable point of the compass, giving the traveler occasional views of tropical luxuriance; taking awful twists and bends to avoid cuttings of 8 or 10 feet in depth; and at last clearing the summit of the isthmus 10½ miles from Panama and the Pacific, with a cutting only averaging about 20 feet in depth and 500 yards long. The greatest grades are 60 feet to a mile, the curves are anything you like, and the maximum elevation to which the locomotive ascends is 263 ft. above the mean tide levels of the two seas. Before the railway was explored and constructed, the isthmus had been surveyed by various scientific individuals, who maintained that a less summit could not be found at Panama than about 400 or 500 feet above the sea. But railway engineers soon destroyed the hypotheses of learned explorers (who so often write about nature, but do not attack her,) and by a good deal of pluck and energy, and a small amount of science, brought the project to a practical issue.

The isthmus presents many picturesque tropical beauties between the Aspinwall swamp and Panama. There are the varieties of palm trees, more than twenty in number, with their clusters of scarlet berries; the cocoa-nut tree with its graceful feathery branches; the gigantic flowering tropical lilies and cactus; the plaintain, prickly pear, and gay flowering shrubs and creepers; and the impenetrable jungle or tropical thicket, clothing the ravines with a dense cover of vegetation, and giving to their undulations a gorgeous clothing.

The earthworks upon the railway are but trifling; there are no large cuttings, (the largest being the summit one mentioned above,) and no very large banks. The bulk of the material for the banks was taken from patches of side cutting taken at the nearest and most convenient points, regardless alike of appearance or finish. Necessity was the order of the day, and style and order had to succumb. These slopes are not trimmed, or even formed at all like slopes, the cuttings being taken out vertically and allowed to form themselves, and they have formed themselves truly, with the assistance of the tropical rains, into very wild shapes. Nature, here so prolific, however, steps in frequently and clothes their deformities by a tropical covering of vegetation. The tops of the banks are shaved down in too many cases to a nicety, being not more than 10 or 12 feet broad at the top, and cut into and guttered up severely by the tropical rains, for want of a proper sodding. Near the summit this deficiency of embankment gives the line a very dangerous look, and especially so where its slopes are washed by the Chagres river. Diversions of the line and sacrifice of good alignment are visible in some places where work has been cut down to its minimum, and pushed through at any sacrifice.

The bridges which were first constructed upon the line were of the

true wooden, temporary, and American type, having a very stagy look about them, and not intended for inspection by posterity. They were in some cases nothing more than trestle-work of the rudest description, and quite unsafe for trains of more than four or five miles per hour. These, however, thanks to the rapacities of a tropical climate, have gone the way of all that is perishable, and crumbled into dust and tropical mildew. Wrought iron boiler plate girder bridges, both for large and small spans, resting upon stone abutments, have been substituted. They are of the simplest character, and have a lean, skeleton appearance. Each bridge is only composed of two ordinary girders, placed directly under each rail, with nothing over them but the common cross-sleepers of irregular lengths, and the rails then spiked to these. No planking, no parapets, (although the bridges are frequently placed on very ugly curves, and the train jumps as it mounts them,) and the bridges *in toto* resemble an ill-constructed gridiron. The masonry is bold, rough, and good, prepared from a blue granite and whitish freestone which are found on the line, in the execution of which negro labor, as in all other classes of work on the isthmus, is largely employed under white superintendence. These bridges have cost a heavy sum, as they have all been constructed on the wrecks of the old ones, since the opening of the line in 1854, and whilst the ordinary traffic has been going on. The iron bridge over the Chagres river, about half way across the isthmus, is the largest and most important work on the line; it has six openings of a hundred feet span each, spanned by as many pairs of boiler plate girders, arranged in this example to form the parapets, with small cross girders, and upon these last the longitudinal timbers are fixed to carry the rails. The whole, however, is left gridiron shape, without planking or finish. It is adapted for a single line only. The upper sides of main girders are curved, which gives to the upper lines of the bridge a wavy and unpleasing appearance.

The permanent way is of the roughest character; being laid and maintained by negro labor, its correctness as to line, level, and finish may be easily judged. The rails are, however, generally good, and of the bridge-rail section, weighing 68 lbs. to a yard. Some short distance of the line is laid with the common Yankee foot-rail, or, as it is sometimes termed in England, the contractor's rail. The rails are fastened to the intermediate sleepers by common spikes weighing less than a pound each, and at the joints are secured very roughly by a small boiler plate chair (8 lbs. weight) and four spikes. This is the universal American system of fixing rails. The rails might, however, have been slotted at one end, through which two of the spikes pass and secure the rail to the chair, and prevent it from sliding. The bridge rails used here were evidently intended for longitudinal timbers; for there are the holes in the flanches for the screw bolts which secure the rails to the continuous timbers. The sleepers now used are of lignum vitæ wood, fetched from Carthagena on the Atlantic side of the isthmus, and cost, when delivered, 6*s.* each. The sleepers originally used (pine) on the line have wholly disappeared; they only lasted from two

to three years. The lignum vitæ sleepers are reported to be of no longer duration than about twelve years. The ballast was omitted from the line almost entirely in its first formation, and now it is not universally used throughout, being put on in patches from time to time, where it is found to be all important to keep the permanent way from being washed out of position by the tropical rains. It is principally formed of broken rock and coarse gravel, both of which are plentiful on the line; it is used sparingly, however, the sleepers being generally on the soft material on their underside, with broken rock packed between.

The traveling on the railroad is very slow, averaging not more than ten or twelve miles per hour. The grades, however, are not excessive, not exceeding as above stated a maximum of 60 feet in a mile; but the locomotives are weak and asthmatic, and they frequently stick on these inclines with very ordinary trains, and the passengers sit under a broiling tropical sun at the bottom of a cutting, with only an inch board intervening between them and the sun, frequently for an hour together. This is not very pleasant when each passenger pays £5 3*s.* for the fare to cross the isthmus, and 6*d.* per pound for all his luggage over fifty pounds weight, which, with something like an ordinary amount of luggage, comes to about 2*s.* 6*d.* per mile per head. The black negro engine drivers too take a long time to pull up at an intermediate station, swinging backwards and forwards in its vicinity for about a quarter of an hour, like the pendulum of a clock. The locomotives and carriages are of United States build and fashion, only a shade worse. There is the bull-whistle to the locomotive, with its funny little wheels in front on a bogie frame, turning on a swivel-joint, and its broad-topped ugly funnel for wood-burning. The carriages are common and dirty, with no double casing to the top to screen the intense heat of a tropical sun, Venetian slides for windows, and hard seats. The station-houses along the line are mere palm huts (excepting at Aspinwall and Panama), and their vicinities have a wild uncivilized appearance, with the black, nude negroes hovering about in all the crudities of uncivilized life.

At Panama, the terminus of the line on the Pacific side, the station has no conveniences of any kind for travelers; no offices for washing, refreshment, and other purposes. The traveler from California to the United States often finds himself here in company with some 1000 or 1200 persons, just arrived by a Californian steamer, suffering from tropical disorders, and no means of comfort at hand, not even civility.

The total cost of the line has been about £27,000 per mile, and the engineer-in-chief from the commencement to the present time has been Colonel Totten, an American. The railway pays a dividend of 12 per cent. per annum, with its present undeveloped traffic.

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*The Railway Work of the Session.**

It appears from an official report issued by the Board of Trade that 192 railway and canal bills are now before Parliament. Of this number, 129 bills authorize new works. In England 61 bills have been

* From the London Mechanics' Magazine, Feb., 1859.

introduced by new companies seeking powers to construct 638 miles of railway; in Scotland five bills, referring to 53 miles, are brought forward by new companies; and in Ireland four bills, referring to 77 miles, are introduced in a similar manner. As regards the movements of existing companies, they have introduced 43 bills for 154 miles of new lines in England, six bills for 78 miles of new line in Scotland, and ten bills for 129 miles of new line in Ireland. The total length of new line proposed is, therefore, 1129 miles, and there are besides 95 miles of deviation lines, and twelve projects for the enlargement of stations.

On the Successful Working, by Locomotive Power, over Gradients of 1 *in* 17, *and Curves of* 300 *feet radius, on Inclines in America.**

By Mr. T. S. Isaac.

[Read before the Institution of Civil Engineers, Nov. 23, 1858.]

It was stated, that the road which had decidedly taken the lead in the United States, in the application of locomotive power to steep gradients, and had been generally the pioneer of improvements, was that extending from Baltimore, on the Chesapeake Bay, to Wheeling on the Ohio river, a distance of three hundred and eighty miles, through a region of considerable difficulties, especially in the various ranges of the Alleghany Mountains. This Company was incorporated in 1827, being the first chartered in America, and a portion of the road was opened in May, 1830. At first it was worked by horses, but locomotives were employed as early as August, 1830,—prior to the opening of the Liverpool and Manchester Railway. It was not until 1851 that the great incline over the main range of the Alleghanies was completed and worked by locomotives. It had an inclination of 1 in 45½ for 11 continuous miles, and, after winding amongst the summits of the mountains for twenty miles, it descended, on the western side, with an inclination of 1 in 45½ for nine continuous miles. The passage of this mountain chain involved altogether sixty miles of railway, twenty miles of which had a gradient of 1 in 45½, and nine miles of 1 in 50, both worked by locomotive power, at a speed of from fifteen to twenty miles per hour for passenger trains, and from ten to fifteen miles per hour for goods trains. The curves were frequently 600 feet radius. Although it was one of the main thoroughfares of American commerce, no extra provision was made for working these inclines, beyond increasing the number of the engines. The engines had eight wheels, all coupled, the diameters of the cylinders being 17 inches, the length of the stroke 2 feet, and the diameter of the wheels 4½ feet. The engines weighed 24 tons each, and the tenders 13 tons each.

In 1852 difficulties were encountered at two different tunnels, which rendered temporary inclines necessary, in order to accomplish the passage of the trains. This system was frequently adopted when it was required to surmount hills where the tunnels were incomplete, in order to enable the iron and other materials for the permanent way to be

* From the London Mechanics' Magazine, December, 1858.

delivered along the line. There was a maximum gradient over the Kingwood tunnel of 1 in 10, and this incline was in operation for several months, the iron and other materials for upwards of forty miles of line, and the United States mails have been conveyed over it by locomotive power. The same engine that was used on the other parts of the line was employed, and it drew a loaded car weighing 13 tons, and a tender weighing 12 tons, or a total weight of 25 tons, at the speed of 8 to 10 miles per hour. Over the Board Tree tunnel there was a series of zigzag inclines, on which the upward motion of the train was alternately reversed, the engine at one time pulling, and at another pushing the cars. There were three of these inclines on the Eastern, and five on the Western slope of the hill. The total length was nearly two miles and one-third, and the gradients varied from 1 in 18 to 1 in 15½, with a minimum radius of curvature of 300 feet. The ordinary freight consisted of two loaded cars, weighing, together with the tender, 37 tons. Mr. Latrobe, the chief engineer of the line, said, in his report for 1853, that as many as fifty cars, containing 400 tons, and two passenger trains, had been taken over this hill in a day by four first-class locomotives; and that, during five months, there had been no accident involving more than a trifling detention. These two inclines, although unprovided with engines especially adapted for the purpose, fully demonstrated the feasibility of traversing gradients, altogether unprecedented, by the locomotive alone. The experience gained in working them not only established the fact, that a rise of 300 feet per mile, and curves of 300 feet radius, could be worked with comparative facility, but seemed to point also to a limiting gradient, beyond which it was impossible for the locomotive to go, with any useful effect, even for a temporary purpose.

Steep gradients and sharp curves had since been adopted on the Virginia Central Railroad, on a more extended scale, and had been in successful operation for upwards of four years. The Mountain Top incline on this road crossed the Blue Ridge Mountains at Rock Fish Gap, in Virginia. This incline was fully described at p. 245 of the 66th vol. of the *Mechanics' Magazine*.*

The author believed that the resistance of the curves had been underrated in America. On the Mountain Top incline it was proved that the resistance of the curve exceeded 25½ lbs. per ton of engine and train. Mr. Latrobe had calculated that the resistance to traction, on a level, was doubled by a curve of 400 feet radius; and he assumed 13 lbs. per ton as the additional friction of the train, on a curve of 300 feet radius, whence the additional friction of the engine, due to such a curve, must have exceeded 49 lbs. per ton of its own weight. Two expedients had been resorted to for diminishing this friction. On the Baltimore and Ohio incline, for a speed of ten miles per hour, the outer rail had been gradually raised, on a curve of 300 feet radius, from 2 inches, the height given by the ordinary formula, to 9 inches. On the Mountain Top Track inclines, for a speed of 8 miles per hour, the outer rail had an elevation of 6½ inches; and a sponge, saturated with oil, was kept in contact with the flanches of the two forward wheels

* See Journal of the Franklin Institute, Vol. xxxiii., p. 217.

of each engine. These expedients had so far reduced the friction on the latter road, as to cause no perceptible diminution of speed on leaving a straight portion of the track, with a gradient of 296 feet per mile, and entering a curve of a radius of 300 feet, having a gradient of 238 feet per mile.

The Virginia Central Company had also constructed a shorter incline, about 100 miles further west, which was one mile and-a-half in length, with gradients varying from 250 to 300 feet per mile, and curves of a minimum radius of 400 feet. Over this incline, which had been in successful operation for two years, the common freight engines, on eight wheels, four of which were coupled, giving 16 tons for adhesion, had taken a load of 36 tons, at a speed of five miles per hour.

The ordinary performances of the engines on the Mountain Top Track, showed an exertion of 181½ horse power, including the engine in the load, or 118 horse power not including the engine; giving, in the latter case, 4·8 horse power per ton of motor, the resistance due to the speed and the gradient being 121·64 pounds per ton.

On one or two occasions, on the incline of 1 in 10, on the Baltimore and Ohio line, the weight of the engine being four and three-quarter times the resistance of gravity and the friction of the load, when the rails were very greasy, the engine and train slid backwards with locked wheels, from near the top to the bottom of this incline, without damage. The wheels of these engines had chilled tyres, a circumstance which considerably decreased their adhesion. The engines on the Mountain Top Track, with an ordinary train, exercised an adhesive power of one-sixth of their weight, and this could always be maintained, in the severest weather, by the use of a fine clean sand.

In conclusion, the author remarked, that there were probably few mountain passes that could not be overcome by the introduction of gradients of 1 in 17, and experience had satisfactorily proved, that the locomotive could draw a load nearly double its own weight up such a gradient, at a speed of eight miles per hour. The working of the Mountain Top Track furnished additional evidence to that already gained from other sources, of the superiority of light engines with light loads, over heavy engines with heavy loads.

(To be Continued.)

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*Fall of Stone Staircase at the Polytechnic Institution.**

Late on Monday evening last, (Jan. 3d, 1859,) at this Institution, a very deplorable event occurred, resulting in the death of one person, and serious injuries to six others, of whom three can hardly be expected to survive, besides more or less wounding some twenty other persons. It appears that after about 800 of the audience had left the building, the staircase (on the left-hand going in), well known to most of our readers, was being descended by the remainder of the thirty or forty lingerers, who always wait to see the complete exhibition, when

* From the London Builder, Nos. 831 and 834.

those upon the middle flight were hurled to the bottom of the well of the staircase by the fall of that flight of steps on to one below it, carrying the under one also into the basement. The immediate assistance of police force and the officials of the Institution saved the surviving sufferers, almost all females, from the immediate perils of their position.

Pending the coroner's investigation, we shall abstain from any comments upon this additional disaster in the midst of the festivity of the new year, in order that no injustice may be done by casting blame in wrong quarters.

The steps are of Portland stone, feather-edged, and were put up twenty years ago, under the direction of Mr. James Thomson, the architect of the building. Not long ago the treads having become worn, open iron work, the interstices filled in with cement, was let in on the face of them, and it has been urged by some that cutting into the steps for this purpose has led to the calamity. The iron facing on each step weighs about 1 cwt. Each step probably weighs 2½ cwt. On the other hand, it is stated that the fall commenced at the upper landing, and that it has been found that the joggle here was not soundly made.

The appearance presented by the staircase is most extraordinary; every step being broken sharply off about 4 inches from the wall. The accident will not fail to inspire the gravest considerations.

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A jury, under Mr. Wakley, coroner, met on Thursday morning last, and, after viewing the body, adjourned for a week, to enable two architects, unconnected with the establishment, to examine and report on the cause of the accident.

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On Monday last, (Jan. 24,) the inquest on the death of the girl killed by the falling of the staircase at the Polytechnic Institution, was resumed; and, after a discussion as to the propriety of taking further evidence including that of the architect of the building and alterations, the coroner summed up, and the jury found a verdict of "accidental death," also expressing belief that the fall "was occasioned by the cutting for the insertion of the iron trellis-work and brackets, and by the incautious manner of doing the work." They further added, that they could not allow the opportunity to pass "without expressing in the strongest manner their opinion that all public buildings should be subject to a periodical inspection." A competent person, appointed by the Government, should certify to some office, prior to the granting of a license for a building intended for public assemblage, that such buildings had been erected and finished in all its parts in a manner suitable to the purpose; and the like inspection, certificate, and license, should be necessary upon occasion of all alterations or repairs of importance. The jury also strongly objected "to the almost irresponsible power now vested in the hands of companies and individuals in the erection and maintenance of our public places of resort," and wished "to impress upon the Government the absolute necessity of not allowing the ensuing session of Parliament to pass without some enactment to enforce these suggestions." Such a course they "deemed imperative to

allay the fears of the public, in consequence of the accidents that have so frequently taken place," and hoped the coroner would forward the suggestions to the Secretary of State.

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*Stone Stairs.** By RICHALD R. BRASH.

The late disastrous accident at the Polytechnic reminds me of a similar one which occurred in the Commercial Buildings of this city (Cork) two years since, but happily without loss of life. The staircase leading from the vestibule to the great hall suddenly fell, the Portland stone steps breaking off within four or five inches of the wall into which their ends had been inserted.

These steps had undergone a similar process to those at the Polytechnic, having had plates of cast iron inserted in the edges of the treads, about 4½ inches wide. As they had previously been somewhat worn, these plates extended to within 5 inches of the wall bearing, and every step broke at the end of the plate.

Architects should be very careful in the selection of the material for the staircases of public buildings; and people generally should be very careful in meddling with them when once up.

It is a singular fact, that in the latter instance no person was on the staircase when it fell, though some few weeks previously it had been loaded to its utmost capacity.

* From the London Builder, No. 832.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED FROM FEBRUARY 22, TO MARCH 28, 1859, (INCLUSIVE,) WITH EXEMPLIFICATIONS.

FEBRUARY 22.

231. METHOD OF OPERATING RECIPROCATING SAWS; T. J. Alexander, Westerville, Ohio.

Claim—Reciprocating the saw by means of right and left hand rocking levers or drivers, jointed to, or otherwise connected with, the saw, when said levers are separately hung or pivoted and geared together for reverse action, and so arranged as to admit of being worked by the hands of the operator.

232. PREPARATION OF ARTIFICIAL FUEL; Henry Adolphe Archerau, Paris, France; patented in France, August 11, 1856.

Claim—Producing artificial fuel by stirring, mixing, or incorporating coal dust or small coal, peat, turf, lignite, or other combustible substances, with rosin, pitch, tar, or other resinous, bituminous, or carbonaceous matters or substances, in any suitable proportions, according to the nature of the materials employed, and by causing steam, hot air, or gases, to pass through the mass during the stirring or mixing operation, or while the carbonaceous and bituminous particles are in motion. Also, mixing vulcanized carbonaceous matter with melted pitch, tar, or other bituminous substances, when the latter are worked up into a frothy state.

233. APPARATUS FOR DESTRUCTIVE DISTILLATION; Luther Atwood, Brooklyn, New York.

Claim—The arrangement and combination of the combustion tower, distilling tower, and steam blast, or their equivalents, in combination.

234. MACHINE FOR JOINTING STAVES; Henry Benter, Wheeling, Virginia.

Claim—1st, The carriage, provided with rollers, and used in connexion with the adjustable guides and rotating cutter head. 2d, The adjustable plate in connexion with the stationary jaw and sliding jaw, attached to the carriage.

235. MEASURING FAUCET; Edmund Bigelow, Springfield, Massachusetts.

Claim—A self-measuring faucet, whose supply valve is closed and discharge valve opened by a single movement, and whose discharge valve is closed and supply valve opened by a single movement produced by a spring, and which is supplied with a vent pipe for letting out the air, and another vent pipe for letting in the air when the faucet is to be discharged, which last vent pipe is shut off when the faucet is to be filled or is standing full.

236. CASTING STEREOTYPE PLATES; Wm. Blanchard, Washington City, D. C.

Claim—Casting stereotype plates for printing by immersing a metallic mould plate, with a mould or matrix formed upon and adhering to it. Also, the manner of casting any number of stereotype plates by immer-

sion, or otherwise, in which each mould plate holds, on one of its sides, a matrix, whereon the face of the stereotype plate is cast in one compartment, while its reverse side, in any compartment, is used as a matrix whereon to cast the back of another stereotype plate.

237. PROPELLER FOR CANALS; Benjamin Burling, Buffalo, New York.

Claim—Propelling canal boats, or other craft, by means of a steam tug placed within a well hole at the stern, and connected therewith by the shackle and stancheons, or their equivalents.

238. WATER WHEEL; N. F. Burnham, Laurel Factory, Maryland.

Claim—1st, The concave hub, in combination with the bucket which forms the wheel. 2d, The chutes or guides, in combination with the wheel by which one-fourth, one-half, three-fourths, or all the water, can be admitted to the wheel, and in each case get the same per centage from the amount of water used.

239. MACHINE FOR BENDING WOOD; Alonzo Chubb, Painesville, Ohio.

Claim—1st, The combination and arrangement of the strap with the guides, in the manner set forth. 2d, Making the guides adjustable by the use of the slots therein, and of corresponding ones in the bed timbers.

240. TRIANGULAR STAND FOR FURNITURE; Thomas W. Currier, Lawrence, Massachusetts.

Claim—The arrangement of the triangular plates with legs on the axle, as specified.

241. VEGETABLE CUTTER; Wm. C. Davol, Fall River, Massachusetts.

Claim—The bed-plate, having the hopper attached, provided with the follower, the vibrating plate lever provided with the double-edged knife and hook and attached to the bed-plate.

242. BOOT-JACK; Henry N. Degraw, Green Island, New York.

Claim—The arrangement of a guide piece for the purpose of operating the jaws, in combination with a swinging platform, which rests on pivots at points between its front and back ends, so that it can be operated by throwing more or less weight on the heel or on the toes of the foot placed on the same.

243. MEAT CUTTER; Benneville Dewalt and Charles E. Schrader, Reading, Pennsylvania.

Claim—The arrangement of the knives in a screw form in different directions from the ends of the cylinder to the centre thereof, to discharge the meat at the adjustable opening in the bottom.

244. CRICKET BATS; M. Doherty, Boston, Massachusetts.

Claim—1st, Constructing the blade of the bat of a wooden shell with a filling of cork, or other materials. 2d, Constructing the handle of the bat of a wooden tube with a central strip of whalebone, or other elastic material of similar character, running down into the blade.

245. MACHINE FOR BENDING AND SETTING SPRINGS; John Evans, New Haven, Connecticut.

Claim—1st, The adjustable or sectional bed, formed of the bars connected to the weights, and arranged as specified. 2d, The adjustable clamps or straighteners formed of the strips placed on rails or bars. 3d, The adjustable or sectional bed formed of the bars, and the adjustable clamps or straighteners, formed of the strips placed on the rails, in combination with the adjustable dies.

246. PUMP; James L. Fagan, Anaqua, Texas.

Claim—The cylinder and hollow shaft, connecting with each other and having a reciprocating partially rotating movement, when said cylinder is perforated and provided with valves, and also provided with the piston, and with the stationary plate fitted within it.

247. COFFEE POTS; James H. Freeto, Wheaton, Illinois.

Claim—The arrangement of valves in the condensing chamber in connexion with the pipes, whereby the steam which escapes through the valve is carried off and deposited in a liquid state into the spout, while at the same time, by the action of the steam, a jet of cold water is admitted into the chamber. Also, closing the opening through which the spout communicates with the coffee pot, by means of a flat valve which is operated by a rod, when the same is applied to a coffee pot which is hermetically closed by a gasket, in connexion with the air tube.

248. MOULDING COVERS OF COOK STOVES; George W. Gardener, Troy, New York.

Claim—Combining with that part of the pattern which gives form to the recess of the cover, the pivoted projections.

249. PLOUGHS; John M. Hall, Warrenton, Georgia.

Claim—The arrangement of the adjustable coulter bar, point, holes, shoe, mould-board, adjustable screw bolt, attachment, pins, key, bolts, and slot in beam, as described.

250. CLOTHES RACK; Winfield S. Foster, Marilla, New York.

Claim—The combination of the rods and heads with the side pieces of the expanding clothes rack, in the manner specified.

251. PLOUGH BEAMS; John S. Hall, Manchester, Pennsylvania.

Claim—An iron or steel plough beam, of an inverted U form throughout its main length, and welded or compressed at its ends, and so made as to be capable of receiving the top of the standard into its hollow portion, and be otherwise conveniently connected to or with the other portions of the plough, and so as to make a cheap and efficient junction of the several parts thereof, and produce a cheap, strong, and durable plough beam.

252. MACHINE FOR CUTTING STRAW AND HAY; W. O. Hickok, Harrisburgh, Pennsylvania.

Claim—The arrangement, in combination with the upper or yielding feed roller and the cutter shaft of the coupling lever, when the said lever connects the said feed roller with the cutter shaft, by having its fulcrum around the said shaft, and also carries the pinion, which connects the pinion of the shaft with the spur-wheel of the near journals of the feed roller, the journals of the said feed roller working in grooves which are curved, so as to be concentric with the said cutter shaft.

253. RAILROAD SPLICE FOR RAILROAD TRACK BARS; Charles Hilton, Albany, New York.

Claim—Deep wrought iron fish-plates secured to the sides of the rails by bolts or keys, and extending downward below the base of the rail, in combination with the gib and wedge.

254. HORSE AND OX SHOES; N. E. Hinds, Cooperstown, New York.

Claim—The curved or semicircular form of the heel calks, with the corners thereof turned inwards or towards the central part of the shoe.

255. Fountain Brushes; L. B. Holt, City of New York.

Claim—A marking brush, consisting of a cistern which is provided with a stationary valve, and having the brush attached to a conical tube which fits into a shell.

256. Harvesters; Moses G. Hubbard, Penn Yan, New York.

Claim—The combination of the curved portion of the finger bar hinged at a, with the spring, forming a yielding and elastic corner or point of attachment of sufficient strength to securely connect the cutting apparatus thereto. Also, the auxiliary adjustable spring, or its equivalent, as described.

257. Steam Boilers; Edward Kendall, Cambridgeport, Massachusetts.

Claim—1st, The arrangement of the water walls, the suspended water spaces, flues, fire-box, lower and upper smoke boxes, and tubes, within the shell of the boiler, as set forth. 2d, In combination with the described arrangement of water spaces and heating surfaces, the arrangement of the hollow fire-bridge, the pipes, the cylinder, and pipes. 3d, The arrangement of the passages for the gaseous products of combustion, the exhaust steam, and the air in the air-heater, as set forth.

258. Packing Bar Lead; Zebulon Kinsey, Dubuque, Iowa.

Claim—The use of the bar or bolt when inserted in perforations made in bars or ingots, and clenched or fastened in the manner described.

259. Steam Pressure Gauge; Thomas W. Lane, Meredith, New Hampshire.

Claim—1st, So combining the indicating tube with the pipe through which the pressure within the boiler is transmitted to the gauge, that the length of tube in either direction from its junction with the pipe shall not exceed a semicircle, and placing the tube in such a position that it shall descend at every point towards its junction with and drain back into the pipe. 2d, Joining the pipe from the boiler with the indicating tube at a point between its two ends, and bending the latter so that the ends of the tube shall be nearly over the points where its two branches are rigidly supported, whereby the tube is rendered less sensitive to the vertical shocks to which it is subjected. 3d, Bending the two portions of the indicating tube symmetrically, or nearly so, upon opposite sides of a vertical line, and connecting the two extremities of the tube with the lever, for the purpose of preventing the horizontal vibrations of the tube from being transmitted to the index hand. 4th, Pivoting the lever to the indicating tube without attachment to the case.

260. Hose Coupling; Robert B. Lawton and W. H. Bliss, Newport, Rhode Island.

Claim—The thimbles, c d, being provided with the shoulder and ground seat or packing, and the thimble, d, provided with the groove with inclined sides and fitted within thimble, c, the above parts being used in connexion with the conical roller or rollers fitted in the screw caps.

261. Fire-plugs; Joseph L. Lowry, Pittsburgh, Pennsylvania.

Claim—Making a single chamber serve the purpose of a cross-pipe, when each main leading into said chamber is furnished with its own stop-cock, and access is had to each stop-cock through said chamber for repairs, &c., thus making one chamber and one cover common to two, three, four, or more mains. Also, arranging the fire-plug immediately over the chamber, for the purpose of effecting a circulation of the water in the pipe between the main and the fire-plug, to prevent its freezing. Also, in combination with the valve and its wing, the hollow set-screws for wasting the water from the fire-plug when said valve is closed. Also, the removable gasket in the ends of the branches or bowls, so as to renew the seats for the valves when necessary, without disturbing the main or stop-cock, access to these gaskets being through the common chamber.

262. Watch Cases; Louis Mabille, City of New York.

Claim—The construction of the case with the front plate fitted to the ring or frame, with a projecting rim and bevel all the way round, when combined with an internal cavity in the back to receive and contain the said plate, when removed from the front.

263. Curtain Lock for Carriages; Samuel Marshall, Wilmington, Delaware.

Claim—The employment of the two metal plates, in combination with the button and button-hole of the carriage and curtain, and with the spring fastening.

264. Water Gauge for Steam Boilers; Alexander Miller, Cleveland, Ohio.

Claim—Operating the valve of an alarm gauge to produce the alarm when necessary, by means of a cam or wiper on a valve stem, and a stationary inclined projection on the socket or tube, or its equivalent, the several parts being arranged and applied in combination with a float attached to the stem.

265. Corrugated Iron Pavements; James Montgomery, City of New York.

Claim—1st, The arrangement and combination of the unequal ribs or corrugations, for the purposes set forth. 2d, The described form and application of the laterally projecting spurs, for the purposes explained. 3d, The dovetailed groove shown, applied to metallic paving, and employed to retain within it concrete and other matter.

266. Grain Separators; Henry Montgomery and Simeon Howes, Silver Creek, New York.

Claim—The aperture, u, when situated immediately below the inclined board, and in combination therewith, for the purposes specified.

267. Locks; L. F. Munger, Rochester, New York.

Claim—The arrangement and combination of the knob with the tumblers and bolt, the said knob having studs out of the line with each other, one stud being in line with the bolt, and the other stud being in line with the tumblers, so that when the key is inserted, one of the studs shall pass by the tumbler, while the bolt is shot out by the other studs, and when the key is withdrawn and the knob reversed, the stud shall lift the tumblers and thus prevent the picking of the lock by the insertion of a key.

268. Screw-plate; Putnam D. Nichols, Hartford, Connecticut.

Claim—The adjusting steady pins and set-screws, with the sliding plate attached to the regulating rod and screw, in combination with the method of adjusting and regulating the dies for operation.

269. Brooches, Ear-rings, &c.; Henry Oliver, Philadelphia, Pennsylvania.

Claim—Photographic or sun-pictures upon concave surfaces of glass, and backing them up with cement, in the manner specified.

270. Blind Fastening; Rufus Porter, Washington City, D. C.

Claim—The combination of the lateral catches with the elevated finger socket, the whole consisting of a single plate, which is so formed, that while the catch end thereof is horizontal, and constitutes right and left catches, and is connected to the bottom of the shutter, the opposite end is vertical, and is connected to the face

of the shutter at some distance above the bottom thereof, and constitutes a finger socket or hook near the hinged edge of the shutter, to be drawn back by a finger for the purpose of unfastening the shutter, when open, and closing the same.

271. LAMPS; Charles W. Richter, Sr., Madison, Georgia.

Claim—The combination of chamber and tubes with the non-conducting medium above plate. Also, the manner of moving the wick within the tube, in combination with the construction described.

272. STALLS FOR HORSES ON SHIPBOARD; Samuel Samuels, Brooklyn, New York.

Claim—Suspending a horse-box on board of a ship or other vessel, on pivots or centres, having their axes arranged transversely to the box, and parallel or thereabouts with the length of the vessel. Also, combining a series of two or more so-suspended boxes, as described.

273. SEAL-PRESSES; Joseph Saxton, Washington City, D. C.

Claim—1st, A sealing-press, operated by a lever, to which the stamp is attached by an adjustable joint, the whole being adapted to the purpose of sealing with fusible metal or alloy. 2d, The guard for retaining the excess of metal driven off from the seal, in the act of making the impression.

274. CURTAIN FIXTURES; Henry C. Spalding, Brooklyn, New York.

Claim—1st, The narrow rim, in combination with a roller having end play. 2d, The combination of the roller, flanch, and cord. 3d, The combination of the two hangers with the roller, the cord, and the rack, constructed as described.

275. TREADLE-STAND; Henry C. Spalding, Brooklyn, New York.

Claim—A self-sustaining skeleton treadle-frame, composed of sections secured together at right-angles, so that the frame is self-braced crosswise and lengthwise with the table which it supports.

276. APPARATUS FOR VENTILATING RAILROAD CARS; Robert Taylor, Reading, Pennsylvania.

Claim—The blowing cylinder hung to one of the trucks of the car, and operated from one of the axles by means of an eccentric, or other equivalent device, in combination with the flexible or self-accommodating inlet and discharge pipes, and the distributing pipes, arranged as set forth.

277. CHUCK FOR WATCHMAKERS' LATHES; G. H. Waldin, Burlington, Iowa.

Claim—The use of the cylindrical core or spindle, in connexion with the thimble for containing sealing-wax, or its equivalent.

278. CEMENTING ROOFS; J. L. G. Ward, Adrian, Michigan.

Claim—The covering of roofs of buildings by laying bricks, or tiles, or slabs of other material, in a bed of cement consisting of an alkaline silicate, and subsequently treating the surface of said cement with an acid which combines with the alkaline thereof, and leaves a surface of pure silica.

279. PESSARIES; Francis F. Wells, Texana, Texas.

Claim—The combination with the ring of the hinge-jointed and slotted standing supports and their stem, the hinged sliding support, the hinged arm, the collar, or its equivalent, and the plate.

280. APPARATUS FOR HANDLING HIDES; Charles Weston, Salem, Massachusetts.

Claim—The apparatus for keeping hides in motion while exposed to the action of the tanning liquid, the same consisting of parts constructed and arranged in relation to each other, as described.

281. FEEDING MECHANISM FOR SAWING MACHINES; Philip P. Weis and F. Schutte, Philadelphia, Pennsylvania.

Claim—The adjustable frame with its rollers, the pressure frame with its rollers, and the feeding screws, in combination.

282. KEY-BOLT FOR ATTACHING CARRIAGE THILLS; G. P. Wilhelm, Bridgeport, Pennsylvania.

Claim—The manner described of fastening shafts and poles to carriages by the arrangement of the bolt, spiral spring, and clips.

283. HARVESTERS, Walter A. Wood, Hoosick Falls, New York.

Claim—Connecting the bent bar to the axle, and allowing its other end free vertical motion between guides. Also, in combination with the bent bar for sustaining the finger end and cutter bars, the continuation of the finger bar and its attachment to the main frame, in the manner set forth.

284. MOWING MACHINES; Walter A. Wood, Hoosick Falls, New York.

Claim—Connecting the bent bar that carries the finger and cutter bar to the main frame by the spring plate, and to the axle by the loop, so that the finger bar may rise and fall independently of the wheel or main frame, or the main frame independently of the finger bar.

285. MACHINES FOR CORKING BOTTLES; Lewis L. Chichester, City of New York, Assignor to David L. Winthringham, Jersey City, New Jersey.

Claim—The toggles, frame, and bar, provided with the plungers, in connexion with an adjustable bottle-stand and bar provided with the tubes. Further, the particular manner of adjusting the bottle-stand, to wit: attaching the same to the frame by means of the lever, bar, arms, cross-bars, and plates, as described.

286. CATAMENIAL BANDAGES; Charles E. Clark, Assignor to self and George W. Clark, Boston, Massachusetts.

Claim—My improved manufacture of menstrual receiver, as made of two inflatable, water-proof, crescentic-shaped vessels, united by a water-proof system, and arranged together and with the septum, and provided with means of supplying them with air, and discharging it therefrom.

287. ELECTRO-MAGNETIC FIRE ALARM APPARATUS; Moses G. Farmer, Salem, Assignor to William F. Channing, Boston, Massachusetts.

Claim—The combination of two or more key-boards or fire alarm strikers with one or more electro-telegraphic alarm machines, in the same closed electric circuit or independent closed electric circuits, by means of a mechanism that will make and break a circuit, as described.

288. RAILROAD CAR SEATS AND COUCHES; Jonathan Good, Assignor to self and B. L. H. Dabbs, Philadelphia, Pennsylvania.

Claim—The arrangement and combination of the pivoted horizontally and vertically moving plate, curved ratchet plates, rack extension, and pinion, as described.

289. STRAW CUTTERS; Wm. Hinds, Assignor to Jerome Hinds, Little Falls, New York.

Claim—The arrangement of the cutters, c c, in combination with the cutter, n, constructed substantially as set forth.

290. MACHINE FOR FINISHING CARBOYS; Lyman Hyde, Assignor to the Ellinville Glass Co., Ellinville, N. Y.

Claim—The shears, treadle, or its equivalent, mandrel, and furnace, placed within a suitable frame, and arranged as set forth.

291. BED-BOTTOM; A. W. Morse, Assignor to self and R. B. Robie, Eaton, New York.

Claim—The combination and arrangement of the rods, gear wheels, staples, pins, wires, or their equivalents, lever, ratchet roller, and pawl, for the purpose of giving the proper tension lengthways and sideways simultaneously.

292. BLACKING; L. R. Rockwood, Assignor to J. L. Clough, Worcester, Massachusetts.

Claim—Edge blacking, when composed of the mentioned materials, in the proportion and manner described.

ADDITIONAL IMPROVEMENTS.

1. SHINGLE MACHINES; James Crary, Middleport, Ohio; patented November 24, 1857; re-issued Sept. 28, 1858; additional dated February 1, 1859.

Claim—1st. The use of the bridles or guide, in combination with wrists of the shaving knives, and the conveying grooves and vertical slots, for the purpose of communicating to the shaving knives a combined drawing knife and approximating motion during the process of shaving the shingles. 2d, The use of the spring check-plate, in combination with the movable gate, to permit one only at a time of the shingle bolts to pass to the shaving knives, and prevent the bolt being drawn back on the retrocession of the feed-board. 3d, The use of a feed-board composed of elastic bars or fingers, each capable of a slight depression at its extremity, so as to accommodate the surfaces of the feed-board to any unevenness or twist in the shingle bolt.

2. RECIPROCATING SAWS; Carlyle Whipple, Cleveland, Ohio; patented January 13, 1857; additional dated Feb. 1, 1859.

Claim—The adjustable ways and the friction wheels, arranged in the manner specified. Also, the vibrating beams, in combination with the ways and their dependent parts, constructed in the manner set forth.

3. MACHINE FOR TRIMMING THE EDGES OF PAPER-HANGINGS; John Waugh, Elmira, New York; patented Oct. 5, 1858; additional dated February 15, 1859.

Claim—The framed ways moving in a curvilinear path on a centre at one angle of frame; the hand lever that operates on frame way, and the springs which keep the frame in position, in combination for the purposes set forth.

4. SPRING BED-BOTTOMS; Henry F. Smith, Washington City, D. C.; patented October 6, 1857; additional dated February 22, 1859.

Claim—The supporting the fixed end of the longitudinal slats in spring bottom bedsteads, by means of longitudinal spring bars, so that the elasticity or yielding of both ends of the slats may be equalized.

RE-ISSUES.

1. REVOLVING FIRE ARMS; Josiah Ells, Pittsburgh, Penna.; patented April 25, 1854; re-issued Feb. 1, 1859.

Claim—1st, The combination of revolving breech and stationary barrel with a lock, so constructed, as that the trigger used to fire the pistol when drawn back raises the hammer to full cock, and there holds it; the revolving breech being at the same time rotated as far as to bring one of the chambers in a direct line with the bore of the barrel, and fastened in that position preparatory to firing the piece, in the manner described. 2d, The peculiar arrangement of the parts of my lock, whereby, as the trigger is drawn back to raise the hammer, the heel of the hammer on the point against which the main spring bears, is brought so nearly under the centre of motion of the hammer, that the force of the main-spring is counterbalanced by the pressure of the trigger on the toe of the hammer, and thus it will stand at full cock or may be fired at once, as may be desired. 3d, The use of the tubular extension on the fore part of the rotating breech, extending beyond and underneath the breech end of the stationary barrel, through which tubular extension the end of the spindle projects, and into which the spindle fits closely, for the purpose of preventing the fouling of the spindle by the residuum of the smoke in firing. 4th, The use of a collar at the end of the tubular extension, for the purpose of forming, in combination with the spindle, a locking connexion between the revolving breech and the stationary barrel, which is furnished with a corresponding recess for the reception of the collar. 5th, Forming that part of the spindle which enters the bore of the rotating breech of smaller diameter at the front extremity than at the end where it locks, but by reducing its diameter suddenly, so as to form a step or shoulder at one or more points within the rotating breech, having a bore of correspondingly diminished diameter for the double purpose of sustaining the recoil of the breech in firing, and of aiding to prevent the fouling of the spindle by presenting an obstruction to the passage of the smoke between the spindle and the surface of the bore of the rotating breech. 6th, Connecting and locking the barrel and breech to the lock-plate, by means of a bracket and spring extending in front of the lock-plate, in the manner described.

2. VAULT LIGHTS; Thaddeus Hyatt, City of New York; patented Sept. 19, 1854; re-issued February 1,1859.

Claim—In the construction of illuminating vault covers, the open frame with its large aperture or apertures closed with glass, in combination with the protection grating.

3. DEVICES FOR PUTTING UP CAUSTIC ALKALIES; George Thompson, East Tarentum, Pennsylvania; patented October 18, 1856; re-issued February 1, 1859.

Claim—The putting up of the caustic alkalies of soda and potassa in small quantities in air-tight wrappings, cases, or boxes, in the manner described, or its equivalent, for the purpose of introducing into general use for domestic and other purposes these articles, which, owing to their peculiar chemical properties, have not heretofore been susceptible of general use in small quantities.

4. IMPROVED STEAM VALVE; George Rieseck, Pittsburgh, Pennsylvania; patented August 15, 1858; re-issued February 8, 1859.

Claim—1st, The valve, with a projecting hollow stem, which is reduced so that its ends present an area only equal, or nearly so, to the receiving ports in the face of the valve, in combination with the main steam chest or chamber, and an auxiliary steam chest or casing, furnished with a stuffing-box, and constructed so as to cover the whole of the valve, excepting the end of the stem or a portion of the back equal, or nearly equal, to the receiving ports in its face. 2d, In combination with the above, the peculiar manner specified of making the face of the valve with six ports, three for receiving and three for exhausting, said ports being arranged in such relation to each other that when the valve is applied to an oscillating engine, one receiving port always stands in line with the exhaust port, and that only four of the ports shall be in use when the engine is working, the other two being kept in reserve, so that by shifting the valve the engine will be instantaneously reversed under a full pressure of steam, without shutting off the steam between the engine and the boiler.

5. MACHINE FOR THREADING BOLTS; Wm. Sellers, Philadelphia, Pennsylvania; patented December 1, 1857; re-issued February 8, 1859.

Claim—The use of rotating dies, in combination with cams, or their equivalents, when both are so arranged as to be capable of revolving about a common centre at different velocities, for the purpose of opening and closing the dies. Also, the arrangement of cams with the open spaces between them, in combination with the die-box and dies, to facilitate the changing of the dies. Also, the mode of attaching the top-holder to the revolving die-box.

6. BOXES FOR PRESERVING ALKALIES; George Thompson, East Tarentum, Pennsylvania; patented September 15, 1857; re-issued February 8, 1859.

Claim—The use of metallic boxes, constructed as described, and united with cement infusible at the degree of heat at which the caustic alkalies of soda and potassa remain fluid, for the purpose of putting up those caustic alkalies in small quantities.

7. SELF-DUMPING COAL BUCKET; John Wust, Philadelphia, Pennsylvania; patented July 13, 1858; re-issued February 8, 1859.

Claim—The combination of a bucket suspended by the handle at points below its centre of gravity, in combination with a self-acting detachable latch operated by the bucket touching the ground.

8. LAMPS; Wm. W. Batchelder, City of New York; patented December 28, 1858; re-issued Feb. 8, 1859.

Claim—The arrangement of small tapers or wick tubes below and on both sides of the main or illuminating burner, in combination with a suitable cap, for the purpose of producing a more complete combination.

9. MACHINE FOR FOLDING PAPER; S. T. Bacon, Boston, Assignee of E. N. Smith, Springfield, Massachusetts; patented May 17, 1858; re-issued February 8, 1859.

Claim—1st, The employment of adjustable points or register pins, or their equivalents, for the purpose of correctly presenting printed sheets to a paper-folding machine. 2d, The combination of a registering apparatus with a paper-folding machine. 3d, The combination of the register pins with the fingers, reciprocating carriage, and slotted bar. 4th, The combination of the slotted reciprocating carriage with the knife. 5th, The combination of the slotted reciprocating carriage with the first pair of folding rolls and knife. 6th, The combination of a folding knife, the edge of which is smooth, with one or more needle points projecting beyond and in a line with the edge thereof. 7th, Securing the needle point or points to the folding knife, in such a manner as that they shall have their main support back of the edge of said knife. 8th, So constructing paper-folding machines, as that the sheet while being folded shall occupy the same time, or nearly so, while passing from the position for receiving its first folds to that of the next and succeeding folds.

10. MACHINE FOR FOLDING PAPER; Steuben T. Bacon, Boston, Mass., Assignee through mesne-assignment of John North, Middleton, Connecticut; patented April 15, 1856; re-issued July 27, 1858; re-re-issued February 8, 1859.

Claim—The use of a stationary folding-knife in a machine for folding printed sheets of paper, as described. Also, the combination of the folding-knives with the reciprocating carriage, as set forth. Also, giving the reciprocating carriage its proper motion by means of the crank and slotted connecting rod, in combination with the lever and link. Also, the device for raising and depressing the fingers, as shown. Also, the combination of the folding and carrying nippers with the stationary folding-knife. Also, releasing the sheet from the nippers, by means as described. Also, the circular knives for separating the sheets, when operated in the manner described. Also, the combination of the levers with double concentric rock-shafts, in the manner set forth. Also, the adjustable check and the mode of releasing its hold by the advance of the nippers, as set forth.

11. MACHINE FOR FOLDING PAPER; Steuben T. Bacon, Boston, Assignee through mesne-assignment of Edward N. Smith, formerly of West Brookfield, Massachusetts; patented Nov. 27, 1849; re-issued January 7, 1851; re-re-issued February 8, 1859.

Claim—1st, Forcing the paper required to be folded between the first set of folding rolls by the knife, while the sheet is on the run. 2d, Forcing the paper from the first fold between two converging and continuously moving, flexible, yielding surfaces. 3d, Forcing the sheet of paper required to be folded upwards, for the purpose specified. 4th, The use of a cord or curved edge knife, for the purpose of forcing the sheet between folding rolls. 5th, The stop for determining the proper position of the sheet for delivering its second and succeeding folds. 6th, The combination of the carrying bands with a stop for regulating the sheet in proper position to receive its second and succeeding folds. 7th, The combination of the rolls and endless aprons or bands with the guides. 8th, So arranging the knives, aprons, and rolls, in a paper-folding machine, as that the sheet may receive two or more parallel folds in succession. 9th, So arranging the carrying and folding rolls in a paper-folding machine, as that only a single series of endless aprons or bands shall remain in contact with the sheet, to conduct it while it is receiving more than one fold. 10th, The lightening pulleys and cords or bands hung upon the movable bar, for the purpose of giving proper direction to the sheet receiving the next fold, after having received a parallel fold. 11th, So conducting a machine for folding paper, as that one or more folds may be omitted at pleasure, and the folded sheet delivered outside of the frame and the working parts of the machine, by simply detaching the knives and removing the stops. 12th, Supporting the folding rolls in adjustable boxes, bearings, or frames, for the purpose of squaring them with the print or register of the sheet to be folded, and providing for the construction and expansion of the endless aprons or bands. 13th, The movable guides for the purpose of squaring the knives to correspond with the print or register of the sheet. 14th, Conveying motion to any pair of folding rolls, running at right-angles to the preceding pair by means of level gears placed at or near the centre of a roll, and between the aprons or bands, whereby the machine is rendered more simple and perfect in its operation. 15th, Pressing the folding sheet previous to its delivery, by passing it between two conveying and continuously moving yielding surfaces.

12. DISTILLATION OF OILS FROM COAL; David Alter and Samuel A. Hill, Freeport, Assignors to selves, John T. Johnson, of said Freeport, Wm. F. Johnson, George S. Selder, and John L. Russell, Pittsburgh, Pennsylvania; patented April 27, 1858; re-issued February 8, 1859.

Claim—The destructive distillation of coal, or other bituminous substances, for the obtaining the liquid products thereof, in the form of what is known as coal oils, by the process described, viz: combining the use of a low temperature not exceeding a low red heat, say about 850° Fah., with the use of retorts so constructed as to have a rotary, or other equivalent motion, for the purpose of agitating their contents.

13. ARRANGEMENT OF MEANS FOR WORKING AND STOPPING CHAIN CABLES; Thomas Brown, London, England; patented July 25, 1854; ante-dated April 20, 1847; re-issued February 15, 1859.

Claim—The faring and radial-flanched annular recess in the capstan for working a cable of any given size, or cables of several different sizes, the same being constructed in the manner set forth. Also, in combination with a capstan or windlass which is capable of working a chain cable when only a partial turn is taken, a set of removable rollers so arranged in relation to the capstan, the deck-pipes, and hawse-holes, that either a port

or starboard chain cable can be continuously hove in by means of said capstan and rollers, or can be directly run out of its locker without any previous overhauling. Also, the within-described arrangement of bow-stopper and after-stoppers, whereby more cable can gradually and controllably be given to a vessel whilst riding heavily at anchor. Also, the clearing guide, in combination with the annular recess of a capstan or windlass which is capable of working a chain cable where only a partial turn is taken, for the purpose and in the manner set forth.

14. BANDAGES; N. Jenson, Washington City, D. C.; patented December 14, 1858; re-issued February 15, 1859.

Claim—The extension spring-frame, arranged so that when the sides are closed by the pressure of the limbs, the rear of the frame will remain open, for the purpose as set forth. Also, the combination with the exterior frame, or when constructed and arranged as described.

15. MACHINE FOR MAKING NUTS, WASHERS, &c.; James Wood, Philadelphia, Pennsylvania, Assignee (through mesne-assignments) of Wm. Kenyon, Steubenville, Ohio; patented October 14, 1851; re-issued February 15, 1859.

Claim—1st, Making nuts for bolts by subjecting the blanks of which the nut is to be formed, at a welding heat, to compression between swages or dies in a close die or matrix, and punching the eye of the nut during the continuance of such pressure, for the purpose of welding up any imperfections in the iron, and giving a symmetrical shape and smooth finish to the nut, and of preventing any injury to the nut which it might suffer by the passage of the punch through it, if it were not thus restrained by the sides of the die-box, and forcibly compressed between the dies. 2d, The use of a die-box closed at the sides for surrounding the nut, and sustaining its sides while it is subjected to pressure. 3d, The combination of the compressing die with the die-box, for the compressing of the nut while it is sustained at the sides, and thus welding up any imperfections in the iron, and compacting its fibre so as to give strength as well as exterior finish and symmetry to the nut. 4th, The combination of the punch with the die-box and compressing dies, for the purpose of compressing, confining, and restraining the opposite forces of the nut during the passage of the punch through it; and thus preventing any injury to the nut during the process of punching, and also for the purpose of ensuring the making of the bore of the nut in the proper relative position to its upper and lower surfaces. 5th, The combination of the die-box, the compressing dies, and punch, for the purpose of making hot-pressed nuts at a single operation, by severing a blank from a bar of heated metal, compressing it into shape, and punching a hole or eye through it, while under compression, and delivering the finished nut from the machine. 6th, Arranging the compressing dies in relation to the punch, and regulating their relative motion, in such manner that any excess of iron in the blank shall be forced into the path of the punch in the compressing dies, thus securing the compression of the nut without risk or damge to the machine.

16. RAILROAD CAR SPRINGS; The Railroad Car Spring Co., Philadelphia, Pennsylvania, Assignee (through mesne-assignment) of Henry M. Paine, Worcester, Massachusetts; patented Oct. 27, 1857; re-issued February 15, 1859.

Claim—A railroad car spring consisting of a body of felt, or other fibrous material, condensed to a given density between two rigid plates, and prevented from expanding beyond that density by a bolt or bolts, substantially as set forth.

17. EXTENSION FINGER RINGS; Samuel Friend and George Seiler, City of New York; patented Dec. 21, 1858; re-issued February 22, 1859.

Claim—A divided springing ring, constructed in the manner specified, whereby the springing of the ring permits the same to pass the joints.

DESIGNS.

1. STOVES; Apollos Richmond, Brooklyn, New York; dated February 1, 1859.
2. HOT-AIR FURNACE; Hiram Bissell, Hartford, Connecticut; dated February 15, 1859.
3. GAS BURNERS; Hiram B. Musgrave, Cincinnati, Ohio; dated February 15, 1859.
4. CARPETS; Elimir J. Ney, Lowell, Mass., Assignor to the Lowell Manufac. Co.; dated February 15, 1859.
5. CARPETS; Elimir J. Ney, Lowell, Mass., Assignor to the Lowell Manufac. Co.; dated February 15, 1859.
6. STEREOSCOPE CASES; Wm. Loyd, Philadelphia, Pennsylvania; dated February 22, 1859.

MARCH 1.

1. ROTARY ENGINES; Abraham Andrews, Bernville, Pennsylvania.

Claim—1st, The mortised valve and its connexion with the rod, as operated by the cam wheel, in combination with the said axle or shaft. 2d, The arrangement of the plungers with their side rollers and cam wheels, in combination with the axle or shaft, as described.

2. BRICK MOULDS; Joel W. Andrews, Norristown, Pennsylvania.

Claim—The arrangement of the pivoted handles, links, and bars, connected to movable bottoms, in the manner set forth.

3. INVALIDS TABLE; Jonathan M. Allen, Worcester, Massachusetts.

Claim—The combination of the revolving table, bed, or leaf, with the column, made adjustable, and capable of being fastened in position, as described.

4. SEED PLANTERS; John C. Baker, Mechanicsburgh, Ohio.

Claim—The arrangement of the wheels, cams, lever, friction roller, and disc, constructed as set forth.

5. MACHINE FOR CROSS-CUT SAWING; Joseph Battin, Newark, New Jersey.

Claim—The driving-pulley of the saw mandrel in connexion with the pulleys, one or both, placed in the carriage, and the driving belt, combined as set forth.

6. SEED PLANTERS; J. C. Benthall, Oakland, Texas.

Claim—The arrangement of the rock shaft, connecting rod, arm, spring, and pendant, for the purpose of enabling the seed-distributing device to be actuated by the leg of the operator.

7. AMALGAMATING RIFFLES; J. S. Briggs, Michigan Bluffs, California.

Claim—The cup punch, as constructed, for saturating wood with quicksilver.

8. HARNESS ATTACHMENT FOR SUPPORTING DRIVING LINES; T. D. Brown, Montville, Ohio.

Claim—An attachment or line-supporter, to be placed on a horse's rump, by securing it to the harness in

the manner shown, or in any equivalent way, said attachment consisting of the adjustable strap, pin and clasp, cross-piece, adjustable standard, and arms, arranged as described.

9. TRAM-STAFFS FOR FACING MILL-STONES; Thomas Brown, Kenwood, New York.

Claim—The arrangement and combination of the supporting ring, arranged to rest or lie on the face of the stone, with the triangular frame and adjustable staff, by which mill-stones may be faced more accurately and with greater facility, either plain or with suitable concavity or bosom.

10. HARVESTERS; Charles Brownlich, Buffalo, New York.

Claim—The pivoted shoe connected to the rear end of the frame of the machine, by means of the bolt upon which it oscillates, in combination with the levers, as set forth.

11. CORN HARVESTERS; J. L. Chapman, Kimmandy, Illinois.

Claim—1st, The combination with a corn harvester frame, having V-shaped conductors, of sickle-shaped revolving cutters, partially serrated and partially plain-edged stationary cutters, upper and lower horizontal spring guides, and endless apron, arranged as set forth. 2d, The partially serrated and partially plain-edged stationary cutters, of the form described, in combination with the rotary cutters, as set forth.

12. HARVESTERS; George E. Chenoweth, Baltimore, Maryland.

Claim—A polygonal step having more than four sides, in combination with a standard or post, the lower of which corresponds in figure with the interior of said step, as described.

13. BEE-HIVES; George H. Clarke, East Washington, New Hampshire.

Claim—The construction and arrangement of the bars, the same consisting in making each of them with a salient, angular, or sharp, or nearly sharp, lower edge or surface, extending lengthwise of it and downward from it, the several bars being arranged at convenient distances for the bees to pass between them or upward into the chambers, as described.

14. ROTARY SHINGLE MACHINE; Anson Alcott, Lakeport, New York.

Claim—The combination of guides, springs, connected therewith, slide, reciprocated from the movement of the cutter wheel, and the shingle cutter, arranged as described.

15. SPICE AND COFFEE MILLS; Charles R. Edwards, Suspension Bridge, New York.

Claim—The burr provided with the flanch and handle cast in one piece, in connexion with the concave grinder having the axle cast upon the same, arranged as set forth.

16. HEMMING GUIDES FOR SEWING MACHINES; Wm. Clemmons, Nicholasville, Kentucky.

Claim—The combination with the hemming attachment of the spring placed in the groove under the pressure pad, as described.

17. SAUSAGE-STUFFER; Henry L. DeZeng, Geneva, New York.

Claim—The construction and arrangement of the parts, A D F, substantially in the manner set forth.

18. WASHING MACHINE; L. A. Dole, Salem, Ohio.

Claim—1st, The arrangement of two winged rollers with a flexible adjustable apron clothes bed, in the particular manner specified. 2d, The use of a flexible apron clothes bed, when made adjustable, as set forth. 3d, The use of an adjustable swinging, self-opening, and self-closing rubber or leather packed valve or partition, in combination with the adjustable flexible apron bed, as set forth.

19. SEEDING MACHINE; Carloss and Darwin E. Eggelston, Beloit, Wisconsin.

Claim—1st, The arrangement of the rotating shaft in two or more parts, driving-pulleys, pulley encasement, seed pockets, stationary perforated bottom piece, adjustable slide, and cut-offs. 2d, In combination with the above, the shipper, and adjustable slide bar or gauge, when the shipper is pivoted to the gauge, to operate as specified.

20. MACHINE FOR BLOWING UNIFORM CURRENTS OF AIR; Jonathan Griffin, Harpersfield, New York.

Claim—1st, Operating the feeders alternately by means of the cross arms with the rollers traversing the curvilinear elevating ways. 2d, Regulating the quantity of air admitted into the air chamber, according to the quantity required, by means of the check wire and sliding arm or brake operating on the balance wheel, arranged as described. 3d, Connecting the top and bottom of the air chamber by means of india rubber straps, or other springs, when used in combination with the mechanism for driving the feeders to overcome and stop the operation of the motive power when the chamber is full, and thereby steady the current of air, and prevent too great strain on the chamber.

21. LAMPS; Elias J. Hale and Charles H. Chandler, Foxcroft, Maine.

Claim—Our improved rack wick-holder, as constructed and applied to the wick and the spur-wheel, so that the teeth of the latter may pass through the rack, and act on both the rack and the wick at one and the same time. Also, the flanch or collar, for the purpose of equalizing the aerial current as it strikes the flame of the wick.

22. APPLICATIONS FOR RESTORING THE HAIR; Beverly Harris, New Orleans, Louisiana.

I do not claim the use of castor oil, bay rum, alcohol, or quinine for hair tonics, as I am aware these ingredients have heretofore been used for this purpose.

Claim—The use of bitter apple and gunpowder, in combination with the before stated ingredients, when used in substantially the same proportion as set forth, and for the purpose of hair tonics.

23. REVOLVING FIRE ARMS; Wm. C. Haynes, Melrose, Texas.

Claim—Combining with a stationary barrel having several tubes or chambers for shot, a rotating cylinder, having groups of chambers, each group of chambers being so arranged as to correspond with the chambers or tubes in the barrel, and also so arranged in connexion with a single cone, or its equivalent, to each group, that the explosion of the cap, or its equivalent, shall fire the whole group to which the cone upon which it was exploded belongs, as set forth.

24. MANUFACTURE OF TIN-FOIL; Wm. W. Huse, Brooklyn, New York.

Claim—The production of tin-foil having but an outer casing of tin, or its alloy, covering a filling of lead or its alloy, by the reduction by pressure of a cylindrical bolt of the latter metal or alloy, which has been previously coated by dipping with the former metal or alloy, and the repetition of the dipping at suitable stages of the reducing process, as described.

25. APPARATUS FOR DISTILLING; Peter Kessler, Belleville, Illinois.

Claim—The employment of the stills and cooler, in combination with the vessels, when said vessels are arranged so as to have a tapering space and an intermediate circulating passage between them, as set forth.

26. HARVESTERS; David P. Kinyon, Raritan, New Jersey.

Claim—The arrangement of the frame which supports the driving wheel, so that the adjustment of the relative position of the driving wheel and cutter is effected by the leverage of the inner frame, in the manner described.

27. APPARATUS FOR HEATING BUILDINGS; Lewis W. Leeds, City of New York.

Claim—Combining the uses of steam and water for heating buildings, by means of one or more water vessels combined with a separate steam boiler, and applied in such manner that the steam from the said boiler is employed only to heat the water in the said water vessel or vessels, and that the said water vessel or vessels constitute the heater or heaters of the air, as described.

28. HORSE RAKES; F. C. Kneeland, Hartford, Wisconsin.

Claim—The arrangement and combination of the shaft pivoted within the frame, and provided with the treadle, arms, and bar, with the frame, when the latter is pivoted to the axle, as described.

29. FASTENING BANDS ON BALES AND PACKAGES; Hazard Knowles, City of New York.

Claim—The method of fastening the ends of a metallic strap or hoop, by passing each end of the strap or hoop through a slot in a metal plate, one edge of which slot is formed with a bent lip on the outer face, bending the end of the strap or hoop over and outside of such lip, and hammering or clenching down both the end of the strap and the lip, that the strap or hoop may be clasped or held irrespective of the body which is to be strapped or hooped.

30. BOILER FOR GENERATING STEAM; Joseph G. E. Larned, Brooklyn, New York.

Claim—1st, The substitution for the parallel or concentric sheets of boiler plate ordinarily used to form the fire-box of steam boilers, of a continuous row or rows of upright water tubes, set side by side, to connect the steam drum or water space above the fire with a water bottom below it, in such way as to form by themselves a water jacket; said tubes being inserted in the sheet above and below by means of necks, or smaller continuations, the diameter of which is so much less than that of the tubes as to leave a sufficient thickness of metal between adjacent perforations of the sheet, when the tubes are placed near enough together to answer the purpose of enclosure; expressly disclaiming, however, the use of such necks, or smaller continuations, in themselves considered, or for any other purpose, or in any other arrangement than that set forth. 2d, The combination of rows of water tubes, set side by side, to enclose the furnace, with tubes arranged annularly to give increased surface, without reference to the particular method of inserting the enclosing or arranging the annular tubes. 3d, The method of inserting the innermost of the tubes, when arranged in pairs, one within the other, so that they may be taken out and put back at pleasure, and without injury, by means of a screw or lock nut joint at one end, and a combined screw and expansion joint at the other.

31. PUMPS; Edwin Lawrence and Robert Safley, 2d, Waterford, New York.

Claim—A circular reciprocating double-acting pump, that will both raise and propel water on both sides of the cylinder at one and the same time, and by the same motion of the arms or piston, as set forth.

32. APPLE-CUTTING AND CORING MACHINE; A. F. Ledbetter, Westminster, North Carolina.

Claim—The cutter attached to the reciprocating frame, in connexion with the annular opening in the bench, and with or without the spout, the parts being arranged as set forth.

33. MACHINE FOR CROZING AND CHAMFERING BARRELS; Hiram Littlejohn, Troy, New York.

Claim—Crozing and chamfering barrels, kegs, or casks, by turning the bulging cylinders of staves in upon or against suitable rests or supports, and around rotating cutters, which turn in opposite directions, and describe circles of less diameter than the inside of the ends of the cylinders of staves, the cutters and the rests being so arranged together, and one or both of them made movable, that the cylinders of staves can be conveniently applied to and removed from the rests and cutters, substantially as set forth.

34. HORSE RAKES; William H. Long, Lancaster, Pennsylvania.

Claim—The arrangement of lever, shifting lever plate, and tooth beam, with axle and regulating screw, constructed as set forth.

35. PAPER MADE FROM REEDS; Henry Lowe, Belleville, New Jersey.

I do not limit myself to the described process of making reed paper, or to any other process equivalent thereto. But I

Claim—The use of reed fibre in making paper, said fibre being prepared from the reeds called Arundinaria, Macrosperma of Michaux, and employed in the manufacture of paper, as set forth.

36. PUMPS; John M. Lunquest, Griffin, Georgia.

Claim—The arrangement of cylinders, piston heads, ball valves, air chamber, and valves, said valves being kept in position by proximity to each other and the sides of the chamber, in the manner specified.

37. CROSSINGS FOR RAILROADS; Samuel Macferren and Strickland Kneass, Philadelphia, Pennsylvania.

Claim—The employment of inclined surfaces at the point where two rails intersect each other, when the said surfaces are arranged in respect to the intersecting rails, as set forth.

38. CARRIAGE SPRING; Edward Maynard, Brooklyn, New York.

Claim—Attaching the returned ends of the spring directly to each other by means of the shackle, as specified.

39. TREATMENT OF CAOUTCHOUC; Morris Mattson, Boston, Massachusetts.

Claim—My improved india rubber composition or manufacture, as made in manner substantially as specified, without any of the oxide of lead, but of caoutchouc, sulphur, and one or more others, or an earth or earths containing one or more finely divided oxides of iron, and employed in a quantity much greater than necessary for simply affording color to the compound, the quantity being essentially in the proportions as stated, or such as will afford the economical and useful results as explained.

40. ROOFING CEMENT; Oscar S. Oaks, South Rutland, New York.

Claim—The employment, in combination with the other substances specified, of the alkaline solution of shellac and the sulphate of baryta, the whole being compounded substantially as and in about the proportions set forth.

41. MOTIVE POWER; John G. Mitchell, Collington, Maryland.

Claim—The application of weights in connexion with the shaft and treadle, so that when disconnected from the treadle the weights are in equilibrio, and subject to be moved by any agency applied to either weight at the end of the lever or arms, so as to produce motion in the machinery at the termination of the machine proper, arranged in the manner described.

42. CONSTRUCTION OF STEAM VESSELS; James Montgomery, City of New York.

Claim—1st, Constructing the hulls of vessels with one or more cavities in the bottom, commencing at or near the stern, increasing in capacity sternwards, as set forth. 2d, Constructing the bottoms of vessels with corrugations extending from stem to stern, which give strength to the hull, and a portion of which form the cavity or cavities referred to. 3d, The described combination, an inclined screw propeller with a hull. 4th, Two or more rudders, operating in combination with the described longitudinal cavities in a ship's bottom.

43. POTATO DIGGERS; Robert Niven, Yates, New York.

Claim—The combination and arrangement of the shoe or share, endless screen, and pendant or supplementary riddle, with the frame and side plates, sinuous slots, and slotted levers, operating conjointly as set forth.

44. MACHINE FOR PRINTING THE ADDRESS ON NEWSPAPERS, &c.; A. H. Nordyke, Richmond, Indiana.

Claim—1st, The arrangement of an endless conveyor for feeding the envelopes under the forms to receive the impressions, and delivering the same after printing, in combination with a driving set wheel. 2d, The two inclined tracks, K and L, arranged one above the other, in such manner that the forms may be carried up the inclined track, K, and delivered upon the inclined track, L, and brought by their own gravity down said track, and under the pressure rollers, and from thence to the point of discharge. 3d, The arrangement and combination of endless band, catch, and jointed track, K, for taking the forms from the end of said track, and delivering them upon the lower track, L, arranged as described.

45. GOVERNOR FOR STEAM ENGINES; G. T. Parry and H. W. Evans, Philadelphia, Pennsylvania.

Claim—One or more revolving weighted spring levers, in combination with the sleeve and the connexions described, or their equivalents, between the said sleeve and levers, when the latter are hung to pins placed at such a distance from the centre round which they revolve, that the weights at the end of the levers shall move in the arc of a circle, contained within, or partially within, the circle described by the said pins, as set forth.

46. CHURN; Andrew Patterson, Birmingham, Pennsylvania.

Claim—The combination of the chamber, a, with the chamber, b, when said chamber, b, serves the double purpose of a lid or covering for the cream in chamber, a, and a frame for the dash-wheel, driving-wheel, and crank, as described.

47. SHIPS' PROPELLER; J. K. Peters, City of New York.

Claim—The arrangement and combination of stops, arm, and blade (more than one blade with the stops being combined with the arm, when desired), as described.

48. LOCK; Daniel Powers, Philadelphia, Pennsylvania.

Claim—The independent movable, expanding, and contracting fence, or its equivalent, as set forth. Also, the union of the upper and lower halves thereof, as specified.

49. CENTRE-BOARD; Noah Pratt, Nicholson, Pennsylvania.

Claim—Applying the centre-board and appliances for operating the same in a movable box or curb which is so fitted into a well-hole, or a stationary curb built into the vessel, as to be capable of being lifted out of said well-hole or curb with the centre-board and all its appliances, as described.

50. HARVESTERS; Daniel Ranck, Intercourse, Pennsylvania.

Claim—The combination of the inclined planes and springs, crank and connecting rod, spindle or pivot, sliding rake head, and curved supports, when these several parts are arranged in the manner described.

51. PLOUGHS; Isaac Rulofson, Penn Yan, New York.

Claim—The arrangement of beam, standard, landside strip, share, mould-board, and piece, constructed and united as set forth.

52. SCREW PROPELLER; G. E. Safford, City of New York.

Claim—The hub made in two discs, with spiral or inclined slots to receive the floats, when the floats are removably secured to the hub, in the manner described.

53. AUTOMATIC BELL-RINGER; E. N. Scherr, Philadelphia, Pennsylvania.

Claim—The manner of automatically producing music from bells by the employment of adjustable pins in the barrel, actuated by clock-work, or other motive power, and giving motion to the hammers, in any manner equivalent to that described.

54. CONSTRUCTING WHARVES; Alexander Stephens, Baltimore, Maryland.

Claim—Brace piles driven at a suitable angle, and having their heads so drawn back as to secure a purchase from the footing of the pile, when combined with vertical piles and capping logs, as described.

55. SMUT MACHINE; D. P. Shaw and F. C. Brown, Rochester, Indiana.

Claim—The arrangement of the blast spouts with the scouring device enclosed within the cylinder, and the fan-box in connexion with the tubes, whereby the grain is subjected to a continual blast during the whole of its passage through the machine, to wit: prior to its advent into the cylinder while being acted upon by the scourer and after it leaves the scourer, as described.

56. WASHING MACHINE; Wm. N. Slason, South Reading, Massachusetts.

Claim—The arrangement and combination of the squeeze gratings or boards with the reciprocating dasher or washer, or rinsing chamber. Also, the application of the separate soap-chamber to the wash or rinsing chamber, in manner set forth. Also, the arrangement of the windlass with reference to the box and brake, as specified.

57. WATER-WHEELS; Jacob Stear, Smicksburg, Pennsylvania.

Claim—The combination of the cylinder, inclined ribs, and disc, with its buckets, constructed as described.

58. HEARTH FOR WORKING AND REFINING IRON; R. D. Stewart and John Christopher, Digonier, and Ross Forward, Somerset, Pennsylvania.

We do not wish to be understood as claiming the steam chamber and perforated hearth described, of any particular shape or dimensions as applied in the various ways set forth, but claim its application in any shape or size required for the purpose mentioned. What we specifically

Claim—Is the steam chamber and perforated hearth, as described, for the uses set forth.

59. APPARATUS FOR SLAUGHTERING HOGS; G. W. B. Story, Carlisle, Pennsylvania.

Claim—The arrangement of the vertical shafts, lever, and bar, with the vertical rotating shaft, and the rectangular frame, constructed as set forth.

60. MASHING; N. G. Thorn, Dayton, Ohio.

Claim—1st, The perforations in the pipes attached to the hollow arms, or any analogous device, by which water, steam, or air is admitted into the mash-tub, in such manner as to distribute it equally, or nearly so, to all parts of the mash. 2d, The spiral agitators, when attached to any revolving machinery, for the purpose set forth. 3d, The surface agitators of whatever form, when attached to revolving tubes, for the purpose set forth. 4th, The use of a self-packing joint applied to mash-tubs, when used for the purpose set forth, in whatever form it may be constructed. 5th, The combination of the surface agitators with a stationary or revolving blast.

61. CORN PLANTERS; Amos G. and A. J. Thompson, Belleville, Ohio.

Claim—The arrangement of spiral springs, in combination with cross-bar and straps, for regulating the movement of the plungers, as specified.

62. MACHINE FOR SCOURING AND HULLING GRAIN; Joseph N. Treadwell, Reading, Connecticut.

Claim—In combination with a bed-stone and runner for scouring and hulling grain, the grooves and rasping plates skirting said grooves, said parts being arranged and operating together, as set forth.

63. SUGAR CANE MILLS; A. Van Trump, Lancaster, Ohio.

Claim—The combination in a sugar cane mill of two or more intermediate small feed rollers, with four or more large crushing rollers, as set forth.

64. SKATES; M. Vandenburg, Newark, New Jersey, and F. Berry, Oswego, New York.

Claim—1st, An elastic front to confine the foot to the skate. 2d, Rendering the foot-board adjustable to feet of various widths by constructing it in sections.

65. PIANO-FORTES; George Vogt, Philadelphia, Pennsylvania.

Claim—The employment of the described rest and bridge, either separately or combined, when the same are constructed and operating in manner set forth.

66. WATER METRE; A. W. Von Schmidt, San Francisco, California.

Claim—Combining with the propeller, the radial partitions or feathers and the re-acting shutes, said feathers and shutes being arranged as set forth.

67. HARVESTERS; Russel Warner, Brattleboro', Vermont.

Claim—1st, The circular cutters attached to bars at the lower ends of rotating shafts, and having an independent rotating motion given them by means of the gearing. 2d, The combination of the cutters, plates, and shafts, with or without the sharpeners, arranged to operate as set forth.

68. HORSE RAKES; Wm. H. White, Garretsville, New York.

Claim—The employment of the two levers when crossed diagonally and pivoted together at d, in combination with the turning rake head, frame, and seat, as set forth.

69. PLOUGHS; J. M. Whitney, Bolton, Massachusetts.

Claim—The arrangement of the hinged arms, adjustable brace, and standard, with the wheel and plough beam, constructed as described.

70. CULTIVATORS; J. M. Whitney, Bolton, Massachusetts.

Claim—The arrangement of the teeth, adjustable mould-boards, frames, and cross-beam, with the branched swivel bar and frame, constructed as described.

71. GAUGE COCK; John E. Wooten, Philadelphia, Pennsylvania.

Claim—The arrangement of the tube, in combination with the cam, rod, and valve, in the manner set forth.

72. VALVE GEAR; A. A. Wood, City of New York.

Claim—The combinations of the links attached to the eccentric rod, and arranged with adjusting gear, as described.

73. MANUFACTURE OF STEEL; F. A. Lohage, Unna, Prussia, Assignor to E. L. Benzon, Boston, Massachusetts.

Claim—The art of manufacturing steel of any desired temper, or hardened according to the various purposes or uses for which the steel may be required, by arresting the decarbonization of the mass of metal in the furnaces at certain points or stages thereof, ascertained and recognised by means of certain phenomena, or external indications manifested by the material, substantially as described.

74. MAKING BOLTS AND RIVETS; J. R. Bassett, Assignor to self and A. E. Bateman, Cincinnati, Ohio.

Claim—The die, substantially as described.

75. CAST IRON FENCE POST; P. Stewart, Assignor to Auchambaugh Brothers, New Lebanon, New York.

Claim—A cast iron fence post, constructed with flanches to protect the ends of the fence rails against being split as well as against moisture, in the manner described.

76. PRECIPITATED SULPHUR; D. E. Paynter, Assignor to self and I. M. Bissell, Philadelphia, Pennsylvania.

Claim—Manufacturing precipitated sulphur from the ashes resulting from the combustion of gypsum and coal dust, in the manner described.

77. TEMPERING STEEL SPRINGS; James Jenkinson, Assignor to self and F. Mandel, Williamsburgh, N. Y.

Claim—Arranging the wires in such a manner that by tying one end of each of the same to one of the arms of the wheel on which the coil is formed, and by extending the ends so tied down to the hub of the wheel the loose ends of the wire serve to fasten the several rings of the coil, as described.

78. MEASURING FAUCET; W. W. Hollman, Eddyville, Kentucky.

Claim—1st, In combination with a faucet-piece, having an induction and eduction pipe, a receiving and variable chamber, so constructed and arranged, that by partially rotating it within the said faucet-piece, the liquid will be alternately received and discharged through a port or ports. 2d, Making the rod polygonal, when used in combination with the variable measuring chamber and its piston, as described.

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79. WATER-WHEEL; Abraham Andrews, Bernville, Pennsylvania.

Claim—The curved concave buckets, in combination with the spiral chamber beneath, as described.

80. CAR-COUPLER; J. B. Atwater, Berlin, Wisconsin.

Claim—The arrangement of the falling gate provided with projection loosely hinged down, turned over at its top, and provided with inclined projection, adjustable piece, pin, lever, and catch, combined in the manner specified.

81. REGISTER FOR SHEETS OF PAPER; S. T. Bacon, Boston, Massachusetts.

Claim—Punching or cutting holes in sheets of paper, for the purpose of securing a more perfect and rapid register in printing and paper-folding machines.

82. DUMPING WAGON; Theodore Bailey, Friendship, Virginia.

Claim—1st, A wagon which dumps itself by the approximation of the wheels. 2d, The combination of a spring catch with the divided reach, as set forth.

83. CONNECTING HUBS AND AXLES OF VEHICLES; David Beard, Shippensburg, Pennsylvania.

Claim—1st, The peculiar manner of effecting a combination of the hub, short auxiliary axles, and intermediate stationary axle, whereby internal auxiliary bearings for the short axle, and an external main bearing for the hub are provided. 2d, Making the end of the main axle convex, and the main bearing in the inner end of the hub concave.

84. YOKES OF SHIPS RUDDER POSTS: W. Beers, Milan, Ohio.

Claim—The construction of a divided yoke for rudder posts, in combination with the employment of a guard of india rubber, or other elastic packing, between the yoke and the post, in order to prevent injury to the rudder post, and also to facilitate the repair of damages produced by the common yoke.

85. SHIPS STEERING APPARATUS; W. Beers, Milan, Ohio.

Claim—1st, The slotted arm or arms, constructed in the manner set forth. 2d, The elastic friction collar or collars, and the elastic guard or guards, in combination with the above described steering machine, for preventing concussion and friction. 3d, The friction rollers, in combination with the screw-nut, for preventing the nut from binding upon the screw.

86. TREATMENT OF VULCANIZED RUBBER; H. W. Beins, City of New York.

Claim—The process described of cementing vulcanized india rubber to, and covering it with, a new layer or unvulcanized india rubber composition, in the manner set forth.

87. ATTACHMENT TO RULING MACHINES; J. B. Blair, Philadelphia, Pennsylvania.

Claim—The application of one or more magnets (electro-magnets) to any ruling machine for ruling paper, in such manner that the magnets shall, either directly or indirectly, be made to control the operations of the pens, through the agency of the paper, in breaking, closing, or changing the circuit of electricity.

88. GRAIN SEPARATORS; J. L. Booth, City of New York.

Claim—A grain separator composed of a box, belt, plates, hopper, pulleys, and otherwise constructed as described.

89. FISH-TRAPS; Daniel Bowman, Tampico, Tennessee.

Claim—Making the dams to incline towards each other and up stream, so as to shelve over and make a dark recess to induce the fish to run towards the shute and trap, when the water is clear as well as when it is muddy. Also, the cover of the shute, for the purpose of shading the water and making it dark, so that the fish will be induced to enter the shute and trap.

90. TRUNKS; Henry Clifton, Buffalo, New York.

Claim—In combination with a trunk made up of a series of drawers, such as described, the hinged plates for holding and locking said drawers to the frame of the trunk, through the intervention of the lid and its lock.

91. HORSE RAKES; I. C. Burget, Davenport Centre, New York.

Claim—1st, The arrangement of the treadles hung to the frame, in combination with the rake-bar and yoke, for raising one end of the rake without disturbing the other. 2d, The combination of the springs with the arm and catch-plate, for holding the rake-bar in position, and at the same time to allow it to yield bodily to any obstruction there may be upon the ground.

92. SEWING MACHINES; J. H. Cooper, Philadelphia, Pennsylvania.

Claim—The combination of the shuttle-holder, arm, L, crank, and arm, M, or its equivalent, when the said holder is attached to, or forms a part of, the arm, L, when the latter is carried by the crank, and when the whole of the parts are arranged for joint action, as set forth.

93. ASHES SIFTERS; Allen Cummings, City of New York.

Claim—The combination of the pyramidal or conical-formed distributor interposed between the entrance and the sieve, the latter being of similar form inverted, these being arranged in relation to each other and to the diaphragm and receptacles.

94. CULTIVATORS; C. H. Dawson, Jacksonville, Illinois.

Claim—The plough-beams, arranged as shown, in connexion with the roller applied to the machine, as set forth.

[A series of ploughs are attached to an adjustable frame, which is connected to an axle, and so arranged that they may be placed higher or lower as desired, and the device is capable of being used as a gang or subsoil plough. In connexion with the ploughs, a roller is placed that crushes and rolls down weeds before them, thus facilitating their work.]

95. LAMPS; M. A. Deitz, Brooklyn, New York; ante-dated September 8, 1858.

Claim—The arrangement of an air chamber in the top of a lamp having a flat wick, when said lamp is provided with a cone or deflector for feeding air to the flame, and the air chamber, with a series of holes for the admission of fresh air, and openings for its passage upwards along the sides of the wick tube, or their or either of their equivalents.

96. MACHINES FOR FOLDING AND REGISTERING PAPER; A. F. Endress, City of New York.

Claim—The arrangement of a series of folding knives at right-angles to one another in the same sliding

frame. Also, arranging the sliding frame in such a manner that it operates a registering apparatus by means of a lever, as specified.

97. ROTARY PUMPS; J. L. Fagan, Anaqua, Texas.

Claim—The combination of the rotating hollow shaft provided with a valve, the cylinder, A, attached to said shaft, perforated at a, and having the adjustable or hinged valve or piston, secured within A, and the stationary stop or cut-off attached to the bed-plate, and fitted within the cylinder.

98. BALLOONS; J. P. Gage, City of New York.

Claim—Operating upon the air by the instrumentality of the balloon itself, constructed in a diamond or lozenge-shaped figure, or any other substantially similar figure, presenting a flat surface to the air, arranged and adjusted with the car suspended from the lowest central point of the balloon by a rod with link joints, or their equivalents, and operated by the fore-and-aft and side halyards, in the manner described. Also, the manner of arranging and adjusting a diamond-shaped flat frame or surface (or any similar shape) to a spherical balloon, with the car suspended underneath, as shown.

99. COTTON SEED PLANTERS; C. C. Garrett, Spring Hill, Alabama.

Claim—In combination with the wheel and brushes, the adjustable plates, arranged as specified.

[In this invention a rotating toothed wheel is employed in connexion with stationary stripping brushes, the wheels and brushes being placed in the bottom of a seed-box which is provided with adjustable plates, the parts being arranged to operate, so that cotton seed may be planted in the same state that they are discharged from the gin, and the discharge of seed regulated as may be desired.]

100. OPERATING PUPPET VALVES OF STEAM ENGINES; Samuel Gaty and Omos Howe, St. Louis, Missouri.

Claim—1st, The steam lifters, J J′, exhaust lifters, K K′, and puppet heads, B B′, with their respective faces, for the purpose of operating steam and exhaust valves and puppet valve steam engines. 2d, The lifter, J, in combination with the jointed lifting piece, T, puppet head, B, and graduated cut-off ring or sector, for the purpose of producing a variable expansion motion, self-regulating or otherwise. 3d, The relative adjustment of the cut-off ring, for the purpose of admitting steam in equal quantities in each end of the steam cylinder, in the manner described.

101. STEAM GAUGE; W. Y. Gill, Henderson, Kentucky.

Claim—1st, Constructing a steam gauge, in which a piston acts in opposition to a spring, in such a manner that the lower portion of the same acts as an alarm by means of openings, and so that the indication may be marked on one or more sides of the upper portion of the stem. 2d, Constructing the portion of the piston of a smaller diameter than the lower and upper portion, and arranging the spring on the portion, above the lower packed portion and below the indicating portion.

102. BURNING FLUIDS; Jonathan Griffin, Stanford, New York.

Claim—The burning fluids, formed in the manner and of the materials set forth.

103. COTTON HARVESTERS; John Griffin, Louisville, Kentucky.

Claim—The cylinder, one or more, provided with a perforated plate, flexible tube or tubes, and made to communicate with the steam boiler by means of the tubes, as set forth.

["Picking cotton by steam!" is indeed a novel idea. The inventor connects a flexible tube with a cylinder provided with a perforated plate and connected with a steam boiler, so that a vacuum may be produced within the cylinder, and the cotton picked from the bolls on the standing stalks by atmospheric pressure, the tubes being presented to the cotton by suitable attendants. In carrying out this invention the inventor designs to have the cylinder above mentioned connected with the boiler of a traction engine, in order to facilitate the transporting of the machine and the moving of it from place to place, or from row to row, in the course of its operations. He also intends to use several cylinders and a plurality of tubes, so that many hands may be employed, and a number of rows of cotton be harvested simultaneously.]

104. METHOD OF OPERATING FARM GATES BY APPROACHING VEHICLES; A. J. Hamilton, Kewaunee, Illinois.

Claim—1st, In combination with the two road levers, the rigid actuating rods, crank levers, latch rod, swivel bar, and latches. 2d, In combination with the road levers, the elevations or hedges, as described.

105. CULTIVATORS; Theodore Heermans, Mitchelville, Tennessee.

Claim—1st, The screw-tapped shoulder or flanch and screw shank of the cultivator teeth, in combination with the screw nut having a series of auxiliary screws, in the manner described. 2d, In combination with the above, the specified arrangement of large and small cultivator teeth.

106. COTTON SCRAPERS; John Henderson, Bluff Springs, Mississippi.

Claim—The forked bar and brace bar, in combination with the beam and wings of a double-winged cotton scraper, when constructed in the manner set forth.

107. MACHINE FOR PRINTING RAILROAD AND OTHER TICKETS; R. M. Hoe, City of New York.

Claim—1st, The peculiar mechanism, or its equivalent, for moving the registering discs on their axes at the proper times, by which means the tickets are numbered consecutively. 2d, Giving such a movement to the registering discs, as will cause said discs to approach, press against, and travel with the impression cylinder, thus giving an impression to the roll of paper, then recede to change the figures of the discs, and allow the inking roller to perform and then again to approach the impression cylinder, and so on as before. 3d, The adjustment of any derangement of the registering discs caused by slip, jar of the machine, or other cause, by means of the plates, or any other means substantially the same. 4th, Inking in a different color the registering figures, by means of a separate inking apparatus. 5th, The printing the numbers on the tickets while the said tickets are continuously advancing, in the manner described. 6th, The guide placed between the impression cylinder and the cutter, or its equivalent, for restraining the strip of continually advancing paper in its proper direction, while its lower end is stopped by the action of the cutter when separating a ticket from the roll. 7th, The combination of the parts by which the tickets are deposited (after being cut) in a vertical position in contradistinction to flatwise in the trough destined to receive them. 8th, The combination of the slide, the spring catches, and the sliding block, by which accumulating tickets are kept in a vertical position.

108. ATTACHING CARRIAGE THILLS TO AXLES; F. L. Kidder, Williamsburg, New York.

Claim—The arrangement and combination of the pivoted spring plate, thill, spring, hook, and self-adjusting key, as described.

109. CORN HARVESTERS; J. H. Kite, Conrad's Store, Virginia.

Claim—The combination and arrangement of the horizontally revolving cutters, vertically revolving

bevel wheels, having plain peripheries, endless apron, axle, hollow shaft, and peculiar spring clutch arrangement, as set forth.

110. MACHINE FOR TURNING IRREGULAR FORMS; D. H. Krauser, Pottsville, Pennsylvania.

Claim—1st, The manner of causing the carriage which supports the work to traverse over the cutters by means of the pulleys, belts, and endless chain, crank arms, and connecting rods, operating in combination with the means described for turning the work on its axis through the plates, bent levers, pawl, and ratchet wheel. 2d, The arrangement of the pulley, belt, and spindle, in frame, with the reverse pattern wheel, arranged as described.

111. MOULDING FEMALE SCREWS; Edward L. Lamb and Samuel Wood, Keokuk, Iowa.

Claim—The match-plate having both the exterior and interior of the pattern formed on it, when the same is divided vertically on a centre line, adapted to a suitable flask and resting guides, on which the two halves of the plate can be withdrawn laterally in opposite directions from the core, for the purpose of moulding female screws, or other articles which do not admit of having the pattern removed vertically from the core.

112. METALLIC LINING FOR WATER COOLERS; Thomas Lavender, Philadelphia, Pennsylvania.

Claim—The lining or casing of an ordinary metallic vessel with tin, prepared and applied in the manner described.

113. CLOTHES FASTENER; Lucius Leavenworth, Trumansburg, New York.

Claim—A clothes fastener made of a single piece or block, and having an open, angular, or curved groove therein to receive and hold the line and clothes upon it by diverging or kinking said line, and thus simplifying and cheapening the clasp by dispensing with the button heretofore used.

114. CHIMNEYS; Joseph Leeds, Philadelphia, Pennsylvania.

Claim—In combination with an outer chimney or casing and an inner passage, two or more ducts or passages between the two for heat, ventilation, or draft, when said inner passages or flues are made by setting on top of each other iron sections with flanches upon them, as described.

115. COTTON PRESSES; Nathaniel J. Lilly, Selma, Alabama.

Claim—The combination of the boxes, bar, and followers, with the shaft, having the opposite ratchet thereon and the swinging weighted catch hung in the bar, together with the rack and pinion, operating as set forth.

116. MACHINE FOR CUTTING STAVES FROM THE BLOCK; James Little, Evansville, Indiana.

Claim—The hollow cylinder provided with the knives and gauge strips, in connexion with the bed and the feeding-belts, or their equivalents, arranged to operate as set forth.

117. CULTIVATORS; Daniel and A. S. Markham, and David Eldred, Monmouth, Illinois.

Claim—The frame formed of two parts connected by the traverse bars, and provided with the sliding or adjustable frames, with the bars and ploughs, attached as set forth.

118. SEEDING MACHINES; Daniel and A. S. Markham, and David Eldred, Monmouth, Illinois.

Claim—The adjustable standard, knife, share, wings, or mould-boards, with or without the tube, arranged for joint operation as set forth.

119. REFRIGERATOR; H. L. McAvoy, Baltimore, Maryland.

Claim—The combination of rising and falling shelf-frame with a non-conducting refrigerating casing, as set forth.

120. COOKING STOVES; Josiah V. Meigs, Nashville, Tennessee.

Claim—The arrangement of the bottom plate of the oven in the same plane as the top plate of the fire-pot, in connexion with the arrangement of the flues leading from the side of the fire-pot directly beneath the bottom of the oven and around it, as described.

121. CHURN; Jeremiah Mitchell, Gosport, New York.

Claim—The revolving box or churn, constructed in the manner set forth.

122. MACHINE FOR SHEARING SHEEP; Wm. F. Morgan, Rochester, New York.

Claim—The arrangement of the cutting device, scroll spring, and necessary gearing, as described. Further, the pressure lever, substantially as described.

123. IRON PAVEMENT; James Montgomery, City of New York.

Claim—1st, A metallic pavement, consisting of a series of ribs or laminæ in planes, parallel, or nearly so, connected at alternate or varying levels by webs of metal, as set forth. 2d, Constructing metallic paving plates with ribs or arches of greater vertical depth in their intervening portion than at or near their sustained edges. 3d, The described combination of a concave or other suitable formed rail, with the projecting edge, and the paving plate, A, and the underlying edges of the plates, A and A′, for the purposes set forth. 4th, The described construction and application of the buttress-plate in connexion with the plate, A, and curb-stones, for the purpose explained. 5th, Connecting the edges of ribbed or arched paving plates by tongue and grooved joints, as shown, or in any mechanically equivalent form.

124. IRON PAVEMENT; James Montgomery, City of New York.

Claim—A street-paving, presenting on its upper surface a series of ribs corrugated or winding in a horizontal plane, as set forth.

125. HARVESTERS; James Willard Patterson and Levi Hanford, Baltimore, Maryland.

Claim—The combination of the cutting knife, the bar, and projections, upon the guards, arranged in the manner described.

126. COOKING STOVES; Richard Peterson, Philadelphia, Pennsylvania.

Claim—The protecting plate with its perforations, when arranged in respect to the oven, the fire-place, and the flues of an elevated oven cooking stove, in the manner set forth, so that the products of combustion, after passing from the body of the fuel, and at the point where they impinge against, and are dispersed by, the said protecting plate, prior to passing some over and others under the oven, may be met by, and intermixed with, jets of heated air.

127. BEE-HIVES; William Powers, Youngstown, Ohio.

Claim—The cap or cover of double walls, the inner one perforated, and the space between filled with charcoal, in the manner specified.

128. Cleaning Castings; Andrew Ralston, Middletown, Pennsylvania.

Claim—The combination of flexible pickers, brooms, or brushes, having a reciprocating, alternate, or oscillating movement with an elevating and depressing table.

129. Harvesters; Andrew Ralston, Middletown, Pennsylvania.

Claim—1st, The arrangement of the receiving apron, sheaf-trough, compressing hook, and levers, when used in connexion with the horizontal and inclined gathering aprons, as described. 2d, The use of the shocking carriage furnished with a shock chamber, having a movable bottom in two parts, as described.

130. Pen-wiper and Paper Weight; John L. Rowe, City of New York.

Claim—The base or weight with cup attached provided with the sponge, in connexion with the pressure pad or sponge connected with the base by means of the frame, and arranged as described.

131. Eraser and Pencil-sharpener; Archibald G. Shaver, Hartford, Connecticut.

Claim—The curved blade eraser with the circular edge pencil-sharpener, and the groove for finishing the pencil point in combination, in the manner described.

132. Cradle-wagon; George Smith, Brooklyn, New York.

Claim—A cradle and wagon combined, when the several parts are constructed in the manner described.

133. Cocks for Water Basins; Horace W. Smith, Hartford, Connecticut.

Claim—The intermediate spindle, in combination with the vertical valve, in the manner set forth.

134. Propeller; Simon P. Snyder and George W. Cook, Minneapolis, Minnesota.

Claim—The arrangement and construction of a propeller, as described, also inclining the shaft of a propeller in relation to the boat in two directions, as set forth. Also, the combination of a screw-thread on the propeller shaft, with a screw-thread in the brace-plates forming the hub of the propeller, and with keys, for the purpose of adjusting and fastening the wheel on the shaft.

135. Ice Pitcher; James H Stimpson, Baltimore, Maryland.

Claim—A double or treble walled ice pitcher, having its inside wall or shell composed of iron or other metal lined or coated internally with porcelain, as described.

136. Cotton Presses; Uriah T. Stuart and Calvin E. Stewart, Fayette County, Tennessee.

Claim—The combination of the rack and pinion with the rope and windlass for operating a press with two pressing-boxes, constructed as described.

137. Manufacture of Shot; Charles B. Tatham, Brooklyn, New York.

Claim—The combination of the netting pot, the regulating valve, the conductor, and the set pan, as described, for dropping shot.

138. Lamp-lighters; Leopold and Joseph Thomas, Brooklyn, New York.

Claim—The arrangement of a trigger, or its equivalent, in such a relation to a serrated sector and to a ratchet wheel, that by the motion of the trigger, a piece of fuse from a roller is fed up and lit, in the manner specified. Also, the arrangement of a continuous fuse, in combination with the lamp.

139. Brick Machines; John Van Riswick, Washington City, D. C.

Claim—The combination and arrangement of the carved or angular hopper with the mould-disk and vertically reciprocating plungers, whereby the upper plungers are caused to pass the hopper without lateral movement, in the manner specified.

140. Grain Cleaning Machines; Hugh Wallace and Wm. Mellon, North Sewickly, Pennsylvania.

Claim—The arrangement of the valve, ducts, and sieves, as described.

141. Seed Planters; George Watt, Richmond, Virginia.

Claim—The series of angular faced rollers arranged relative to their shaft, as described, for opening the furrows, in combination with the seed tubes and covers.

142. Water Wheels; Charles Wells, Monroeton, and Wm. Douglas, Bradford Co., Pennsylvania.

Claim—The combination of the scrolls, vertical buckets, and lower buckets, arranged as described.

143. Churn; L. J. Wicks, Racine, Wisconsin.

Claim—The arrangement in a square churn, which is provided wich a ventilating top, of the shaft, inclined arms, cross-pieces, and funnels, in the manner specified.

144. Apparatus for Evaporating Fluids; C. S. Wheeler, Flowerfield, Michigan.

Claim—Combining the evaporating pan with the steam boilers, in such manner as to cause the upper sides of said boilers to form highly efficient heating surfaces within said evaporating pan. Also, conducting the steam from the boilers to the engine, which may be combined therewith, through the medium of a series of pipes, which are so located that their peripheries form portions of the heating surface of the evaporating pan; but this I only claim when the said evaporating pan is combined with a series of steam boilers. Also, combining the spaces between the double bottoms of the clarifying pans with the steam boilers, when the said pans and boilers are arranged with each other and with the evaporating pan, as set forth. Also, the passing of the fluid to be reduced through a coil of pipe, located within the chimney or flue space, before discharging the same with the clarifying pans; but this I only claim when the said clarifying pans are arranged with the evaporating pan and the series of steam boilers, as set forth.

145. Burning Fluids; Wm. Wilber, City of New York.

Claim—A fluid compound for burning in lamps, &c., made of coal tar, camphene, and alcohol, substantially in the proportions and manner set forth.

146. Ploughs; Solomon Williams, Jr., Hume, New York.

Claim—The arrangement of the adjustable wheel with the landside of the plough, as described.

147. Firemen's Protector; C. D. Woodruff, Toledo, Ohio.

Claim—The double-walled sheet or plate metal house, and mounted on wheels, and provided with look-out holes, and an adjustable plate to receive the nozzle or butt, the house being placed on rollers in the platform, and secured by buttons, or their equivalents, arranged as set forth.

148. Seeding Machine; E. O. Baxter, Assignor to self, E. H. Riley, and W. T. Sweet, Forreston, Illinois.

Claim—1st, The cam, one or more, attached to wheel, in combination with the jointed pendant attached

to the lever. 2d, The levers, connected together and arranged relatively with each other and the driver's seat, as specified.

149. Electro-magnetic Machines; W. H. Burnap and J. A. Bradshaw, Assignors to W. H. Burnap, Lowell, Massachusetts.

Claim—Applying the oscillating balance wheel with its shaft in line with, but detached from, a rock shaft or its equivalent, carrying an arm which derives a positive oscillating movement from the train of gearing which drives the magnetic-electric machine, and connecting the spring, which is attached to said balance wheel, with the so arranged moving arm, as specified.

150. Burglar Alarm; R. M. Campbell, East Cambridge, Assignor to W. G Crombie, Boston, Massachusetts.

Claim—The application of the spring fastener to the alarm or its case, so as to be capable of sliding and turning with reference to the same, as specified.

151. Electro-magnetic Fire Alarm Apparatus; M. G. Farmer, Salem, and W. F. Channing, Assignors to W. F. Channing, Boston, Massachusetts.

Claim—1st, The independent keys with their pins, in combination with the rack and a means of liberating the rack, for the purpose set forth. 2d, The arrangement of the segments on the circuit wheel, in combination with the springs, or their equivalents, for throwing the electric current successively on to different circuits. 3d, The double circuit wheel, or its equivalent, for the purpose of completing and interrupting an electric circuit at both ends.

152. Table Caster; R. Gleason, Jr., Assignor to R. Gleason & Sons, Dorchester, Massachusetts.

Claim—A caster, egg-stand, and table bell, arranged as described.

153. Extension Table; Thomas Gray, Assignor to self and J. M. Sankey, Philadelphia, Pennsylvania.

Claim—1st, The method of constructing and of connecting together the two cross-bars, B and B′, that is to say, constructing one bar, B, in two parts, and connecting the two parts together by the two plates, which admit the bar, B′, and afford a means of joining it to the bar, B′. 2d, The combination of the screw, block, bars, and cross-bars, with the two ends of the table, arranged as set forth.

154. Machine for Hewing Out Hubs; G. W. Miles, Michigan City, Indiana, and P. P. Lane, Assignors to Lane & Bodly, Cincinnati, Ohio.

Claim—1st, The arrangement and combination of the axles, stud shaft, and rotating rest, for hewing out cylindrical forms, in the manner set forth. 2d, In combination with the above, the ways, carriage, feed arm, pawls, and rack, as explained.

155. Register for Sheets of Paper; John North, Middletown, Connecticut, Assignor to self and D. Appleton & Co., City of New York.

Claim—1st, The attachment to the feed table of the printing press of two or more register points in addition to those commonly used for printing, so as to make register point holes in the sheet to be printed at the exact points required for the purpose of feeding the sheet in register to the folding machine to be folded. 2d, The application for that purpose of the described mechanism, or other suitable mechanism of the same general description, attached to the feed table, frame, and carriage of the printing press, and which will produce the intended effect.

156. Bedstead; Samuel McQueen and Wm. Lyon, of the District of Abbeville, South Carolina, administrators of the estate of B. M. Lyon, deceased.

Claim—The use of the hinges in the middle of both the cross and longitudinal rails, in combination with the hinges between the rails and posts, as specified.

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157. Adjustable Wormer for Ramrods; George E. Baldwin, West Meriden, Connecticut.

Claim—A wormer that can be run out of or into a ferule on the end of a ramrod, so that the ramrod can be practically shortened or lengthened at pleasure.

158. Breech-loading Fire Arms; Joseph Barber and P. C. Reinfried, Bridesburg, Pennsylvania.

Claim—The arrangement and combination of the spring trigger guard, pin, toggles, sliding belt, and catch, as described.

[This invention consists of a sliding bolt connected with a toggle below the stock, and an elastic spring trigger guard, acting in combination with a beveled catch in the breech to lock the latter in line with the barrel for discharging, and also to unlock it for loading. A spring is also arranged below the breech to raise it to position for loading when it is unlocked.]

159. Chair Bottoms; Z. B. Bellows, Cortlandville, New York.

Claim—The application to chairs of a bent, stamped, or pressed board for a seat.

160. Magazine Fire Arms; Paul Boynton, Canton, New York.

Claim—1st, Combining the powder magazine in the stock with the barrel of a fire arm, by means of the faucet-like chambered breech, applied and operating as described, to measure its own charge. 2d, Combining the bullet-loading slide with the faucet-like chambered breech, by means of the ears on the slide, and the horns attached to the breech, that the slide may be operated in combination with the breech, in the manner specified. 3d, The combination with the faucet-like breech of the priming box, and its perforated collar, q, operated by a connexion with the hammer.

[This invention consists in providing for the loading at the movable breech, with loose powder from a magazine within the stock, and with balls from a magazine under the barrel, whereby the operations of loading and firing are executed with great rapidity. By the act of cocking the hammer, a contrivance combined with the breech furnishes the priming for every charge.

161. Machine for Bending Wood for Felloes; George A. Brown, Newfane, New York.

Claim—The arrangement of the platform, screws, and spring, with the mould-block, constructed in the manner specified.

162. Machine for Grinding and Polishing Saws; Samuel S. Campbell, Montreal, Canada.

Claim—1st, The specified arrangement of the longitudinal carriage ways on supports, so that they, with the carriage and all attachments, may be inclined laterally, and caused to stand obliquely to the horizon, or the circumference of the lap or grinding-stone. 2d, Arranging one of the supports of the machine on a pivot and the other on a truck, which reciprocates on a circular railway, so that the carriage ways and carriage,

with all attachments thereof, may be adjusted in the path of a circle, so as to stand oblique to the shaft of the lap or grindstone. 3d, Providing the longitudinal reciprocating carriage with a stationary stop and a capping or holding down plate, which is adjustable up and down, but stationary longitudinally.

163. APPARATUS FOR REGULATING THE SUPPLY OF WATER TO STEAM BOILERS; J. M. Colman, Vincennes, Ind.

I do not claim the float in boiler, or the cranks, levers, water-chest, valve, or detector. But I

Claim—The combined arrangement of these to effect the object desired, to regulate the water in a steam boiler to any desired point, from which it cannot materially change.

164. PACKING CARTRIDGES; Samuel Colt, Hartford, Connecticut.

Claim—The application of a string, wire, or other equivalent, to a cartridge package or box, by which the package or box may be opened.

165. GRINDING APPLES; A. Dean, Jerusalem, New York.

Claim—The crushing lever and horizontal wheel, constructed as described. 2d, The eccentric wheel and carriage, in combination with the cutter and wheel, I, constructed in the manner described.

166. PREVENTING COLLISIONS ON RAILROADS; Abram Dehuff, York, Pennsylvania.

I am aware that the shoe or boot running under the wheel is not new; it has been made by others, and I do not claim it. But I

Claim—The spring carrier hung on two inclined staples beneath the car or truck, to hug or embrace the wheels, cross-bar, C, long bar, E′, lever, F, rod G, lever, H, rod, I, levers, J J, and levers, K, arranged as described.

167. MACHINE FOR FOLDING WOOL; R. D. M. Edwards, Franklin, Michigan.

Claim—The table rim, the folding lids, operated by catches, levers, and springs, riser, and platform, constructed as set forth.

168. HANGING WELL BUCKETS; S. F. Dexter, Paris, New York.

Claim—1st, The iron strap with the levers and notch to receive the spring stretcher, in combination with the chain and the manner of detaching the same by coming in contact with the rod. 2d, The springs, when operated as described. 3d, Hanging the buckets at or below the bottom, in combination with the spring or springs and levers, as described.

169. CORN PLANTERS; Stephen Elliott, Washington, Indiana.

Claim—The arrangement of the wheel and pins, the spiral springs, the boxes, blocks, the rod, indicator, and leveling plough, constructed as described.

170. OBTAINING CURVED PRINTING SURFACES; Wm. H. Elliott, Plattsburg, New York.

Claim—1st, The combination of screws with the concave cylindrical form, when these devices are used for bringing the compound flexible matrix or impression sheet to the required shape, or for holding it there, while metal is being deposited or cast upon it, for the purpose of constructing electrotypes or stereotypes. 2d, The employment of bars in combination with the flexible sheet for holding the matrix in a cylindrical form, when said bars are so applied to the ends of said sheet, that they shall prevent its being displaced or springing up from the concave face of the outer shell, whether said bars are attached to or rest against the edge of said sheet. 3d, The grooves in the inner shell, for casting upon the back of cylindrical type plates, lugs, or flanches, by which said plates may be fastened upon a cylinder, as set forth.

171. SUGAR MILLS; Ralph Emerson, Jr., Rockford, Illinois.

Claim—The combination of parts in the machine, in such manner as to subject the cane first to a lighter pressure, and afterwards to a heavier pressure, and to deliver the respective juices expressed by said lighter and heavier pressures into separate receptacles, for the purpose specified. Also, the combination of the gauge fillets with the pressure rolls, whereby any unskilled operator is enabled to adjust and work the machine.

172. PROCESS FOR EXTRACTING AND ASSORTING VEGETABLE JUICES BY PRESSURE; Ralph Emerson, Jr., Rockford, Illinois.

As I have procured a separate patent for the said mill, I refer to that patent for a more full description of it. In this patent I do not mean to limit myself to any special means for the extraction and separation of the pith and rind juices. But I

Claim—The process of expressing and collecting the juice of the pith separately from that of the rind, for the purpose set forth. Also, as one of the methods (and the best to me known,) whereby the process of extracting the juices separately may be beneficially carried into effect, the subjection of the cane to a light pressure, to express the juice of the pith, previously to the employment of a heavier pressure, to express the juice of the rind, whether the said pressure be successively performed in the same or in different machines.

173. WATCH CHAINS, &c.; Henry Epstein, City of New York.

Claim—Constructing a watch chain, which may be made stiff or inflexible at pleasure, by the turning of part of the tubular casing to which an interior chain is attached, in the manner described.

174. OPERATING FEED ROLLERS FOR PLANING MACHINES; B. Fitts, Worcester, Massachusetts.

Claim—The arrangement of the gears in combination with the eccentric, constructed in the manner set forth.

175. SELF-PRIMING FIRE ARM; C. W. B. Gedney, City of New York.

Claim—The pivoted chamber or magazine within a recess in the hammer head, and operated by a link pivoted to the lock-plate, or some other stationary part of the pistol or other arm. Also, cutting off the priming of the edge of the hammer face, and carrying the same into the proper position for exploding upon the nipple or cone.

176. COMBINED LETTER AND ENVELOPE; E. B. Gleason, Boston, Massachusetts.

Claim—The combination therewith (that is, the letter sheet,) of the envelope composed of the superscription and post-mark portion, and the single flap, or the same and the two flaps, arranged together and with respect to the letter or billet portion, as described.

177. BARREL PACKER; W. H. Glasgow, City of New York.

Claim—1st, The rotary cam with barrel attached, in connexion with the vibrating hammer. 2d, The plate, having a rotary and a vertical reciprocating movement, for the purpose specified. 3d, The cam, plate, and hammer, arranged for joint operation as set forth.

178. APPARATUS FOR HEATING AND PURIFYING THE FEED WATER OF STEAM BOILERS; Jacob Guhmann, Rochester, New York.

Claim—The combination and arrangement of the bent siphon-shaped tube, having the induction and

eduction openings at the highest parts thereof, with low receiving portion, whereby the water is made to pass a considerable space of vertical pipe the more effectually to deposit its impurities in *b'*, both while descending and ascending, together with the waste-cock and conjoint cocks, lever, and connecting rods and cranks, as described, for simultaneously opening and closing the same.

179. MACHINE FOR DRESSING HEELS OF BOOTS AND SHOES; Horatio Guild and Luther Hall, Boston, Mass.

Claim—The combination of the adjustable hub, jaws, and pattern thereof, with their curved supporting rack and the self-adjusting knife or knife-frame, applied together, and to a bed or table, or the equivalent thereof, as specified.

180. MEAT MINCER; A. W. Hale, New Britain, Connecticut.

Claim—A cutting or mincing machine, operating by means of a cylinder or cylinders, having tapering grooves extending from end to end, in combination with, and revolving in, fluted or ribbed cases, and acting against a stationary knife or knives placed in a plane parallel with the axes of the cylinders.

181. COMPOSITIONS FOR ROOFING; John Hobrecker, Quincy, Illinois.

Claim—The process described of preparing plastic material of the composition stated, without the aid of external heat, for the purposes set forth.

182. SHIPS LIGHTS; Enoch Hidden, City of New York.

Claim—1st, The swivel wrench of the button, and supporting the shaft or spindle thereof by the brace-piece above the frame. 2d, The inclined surfaced button with swivel wrench, in combination with the slotted lug of the main frame. 3d, In combination with the aforesaid construction, the attachment of the light frame to the main frame, by means of the hook and pin, as described.

183. HOOP-LOCK FOR SECURING THE ENDS OF METALLIC BANDS; P. C. Ingersoll, Green Point, New York.

Claim—The loop and key fitted together and applied to the hoop, as set forth.

184. ROTARY PLANING MACHINE; H. C. Ingraham, Guilford, and H. S. Ingraham, Granger, Ohio.

Claim—The arrangement of the cylinder with the two upper feed rollers and the matching burrs, in combination with the vertical sliding frame, for the purpose of preserving the same thickness of timber between the face of the board and the tongue and groove. Further, the sliding gripe, in combination with the ways, lever, and ratchet, arranged in the manner set forth.

185. MODE OF OILING JOURNALS; D. B. Jordan, Woonsocket, Rhode Island.

Claim—The combination and arrangement of the shafts, the disk, the sliding valve, and the spout, constructed as described.

186. SPARK EXTINGUISHER; James Keniston, Cincinnati, Ohio.

Claim—A tank, arranged beneath the boilers of furnaces in such manner as to receive the sparks and cinders therefrom, and extinguish and discharge them by means of a current of water passing through the tank, as described.

187. LANTERNS; W. M. Kimball and K Hartman, Cleveland, Ohio.

Claim—The segments, the spring, and arm, or their mechanical equivalents, in combination with the hooks, arranged in the manner specified.

188. LOCKS AND LATCHES; W. S. Kirkham, Branford, Connecticut.

Claim—The combination of the nosing provided with the double inclined flanch, with the bolt or latch, having its outer end rounded and leveled in a vertical plane, to operate in the manner set forth.

189. PEACH-CUTTING AND STONING APPARATUS; J. C. Kuhn, Boonville, Arkansas.

Claim—The knives curved and crossing each other and attached to the elastic bars, in combination with the lever provided with the pin. Further, the above parts, when placed on the box provided with a tube, and the several parts arranged relatively with each other, so that the stones will be separated from the pulp or flesh.

190. RAILROAD GATES; Shields Liggett, Staunton, Virginia.

Claim—The opposite sliding sectional gate, in combination with the levers, F F', rods, levers, G G', sliding bars, and springs, arranged as set forth.

191. STEREOSCOPES; William Loyd, Philadelphia, Pennsylvania.

Claim—A stereoscopic instrument having eye glasses at opposite sides and double reflectors, in combination with a revolving picture-holder, arranged as described. Also, the grooves on opposite sides of the frames, for the purpose of holding two pictures in contact with each frame.

192. LOADING ORDNANCE; W. E. Moore, Crawfordsville, Indiana.

Claim—1st, The combination with a cannon, or other piece of ordnance, of a system of mechanism which will receive the charge, carry it opposite the bore of the cannon, force the same up to the breech of the cannon, and then be capable of being moved out of line with the bore of the same. 2d, In combining with the above system of mechanism, a needle for pricking the cartridge after it has been forced up to the breech, said needle coming into action simultaneously with the retreat out of line with the bore of the cannon, of mechanism employed for introducing the charge, and then retreated out of the way, ready for the application and explosion of the cap. 3d, The combination of a cap charger and exploding hammer with the first and second systems of mechanism above claimed, whereby simultaneously with the retreat of the needle a cap is brought over the touch-hole and exploded. 4th, A cartridge box, which has a yielding spring stop, in combination with the first system of mechanism above mentioned.

193. CAR BRAKES; W. E. Moore, Crawfordsville, Indiana.

Claim—1st, Making the windlass chain shaft in two parts, and uniting said parts by a universal joint, and arranging the main friction roller on one section of the shaft, and the windlass drum on the other. 2d, The employment of an auxiliary friction roller, in combination with main roller and locomotive driving wheels, when said auxiliary roller is arranged to rise the main friction roller and the locomotive wheel, through the peculiar scale beam or weighing arrangement. 3d, The employment of a pivoted pawl, in combination with a racket drum having two circles of reversed set teeth, which incline on their deepest faces toward the centre of the drum.

194. BOTTLE STOPPER FASTENINGS; H. W. Putnam, Cleveland, Ohio.

Claim—The bottle stopper fastening formed of two pieces of wire, the same being united by means of the points passing through the loops, constructed and having the wire adapted to them as herein described; thus forming a hinge and securing the same to the neck of the bottle by looping together the ends of the wire.

195. Mode of Applying Springs as a Motive Power; G. W. Morgan, Plattsburgh, New York.

Claim—The arrangement of the springs and wheels with lugs and pinions, concentrating the power on the pinions on each side of the wheel, and the pinions and shafts for winding up, at the same time, all the springs on either side of the wheel.

196. Speaking Tubes for Ships; D. S. Neal, Lynn, Massachusetts.

Claim—The arrangement of the speaking tube with a cask, or equivalent float, as specified.

197. Meat Cutter; J. G. Perry, Kingston, Rhode Island.

Claim—1st, Placing the knives on or across the shaft and holding them by their ends, to prevent them from turning. 2d, The manner of constructing the shaft and stud plates, as set forth.

198. Fastening for Folding Doors; E. S. Roberts, Brooklyn, New York.

Claim—The combination of the sliding bolts applied to folding doors, to operate as set forth.

199. Steering Apparatus; G. W. Robinson, Boston, Massachusetts.

Claim—The segment having the teeth on the interior vertical face of the curve, in combination with the gears and shaft connected with the tiller, and moving therewith, arranged in the manner set forth.

200. Preparing Hop Liquor for Brewers; A. S. Rollins, Albany, New York.

Claim—The preparation of hop liquor, for the purposes of distilling and brewing by the process set forth.

201. Water-wheel; P. H. Roots, Connersville, Indiana.

Claim—The wheel and rotating breast or abutment moving with different degrees of velocity, in combination with the apron or concave, arranged as set forth.

202. Washing Machine; J. L. Rowley, Angola, Indiana.

Claim—Constructing the bottom of the box with three sides of an octagon, the two outer sides to have ribs of an octagonal shape, set at an angle of 45° with the sides of the box and bottom, to be horizontal, with two rows of rubbing pins or knuckles set alternately with the valleys between the ribs, in combination with the vibrating rubber, having the rubber surface octagonal, and the rubbing knuckles set so as to work alternately with the spaces between the pins in the bottom of the box, and diagonally with the ribs on outer sides of the bottom.

203. Cast Iron Rails for Railways; J. E. Russell, Brooklyn, New York.

Claim—A cast iron railroad rail, having its neck vertically corrugated, as described.

204. Apparatus for Evaporating Sugar Juices; James Smart, Mansfield, Ohio.

Claim—1st, In the construction of pans, the combination of the inclined bottom with the inclined zigzag partition. 2d, The combination of two pans and two flame chambers, of the peculiar construction described. 3d, Supporting the pans at or near the centre of their length by pivots, and at their ends by spiral springs, as set forth.

205. Machine for Freezing Cream, &c.; S. W. Smith, Brooklyn, New York.

Claim—1st, The cylinders, in combination with the scrapers and reservoir, constructed in the manner described. 2d, Combining with the cylinders a perforated distributing reservoir, for the purpose of furnishing the material in the desired quantities to the cylinders.

206. Electro-magnetic Medical Apparatus; Heinrick Soltmann, City of New York.

Claim—The arrangement of the vibrating spring armature and the connexions therefrom, in combination with the key, arranged and acting as specified, to throw the shock off the person, or repeat the same. Also, the regulating cylinder, constructed in combination with the medical electrical machine, fitted and acting in the manner set forth.

207. Lever Jacks; Frederick Stamm, Lampeter, Pennsylvania.

Claim—The combination and arrangement of the lever and link rod, hinged together with the block and link seats, as described.

208. Rotary Stave Machine; George Starkweather, Hartford, Connecticut.

Claim—The horizontal revolving cutting rims for dressing staves on the two opposite sides at the same time. Also, the arrangement of one or more feed boxes upon the plate over the cutters, with the feeder produced from the worm.

209. Sugar Mills; T. E. Hunt, Assignor to self and N. T. Hunt, Indianapolis, Indiana.

Claim—1st, The combination and arrangement of the frame, rollers, and gearing, E, with the cone, gearing, F, bolt, and spring, constructed as set forth. 2d, The trough with aperture, constructed as set forth.

210. Device for Raising Water; D. E. Teal, Norwich, New York.

Claim—The arrangement of the rope or chains, the hooks, and bail of the cast iron box, adjustable flanch, collars on the windlass, and the windlass, whereby the bucket can be lowered, filled with water, raised and lowered, by merely turning the windlass.

211. Washing Machine; G. W. Tolhurst, Liverpool, Ohio.

Claim—The shaft, blocks, and wedges, or their equivalents, in combination with the oscillating rubber, slatted bottom, dirt chamber, and box, arranged as set forth.

212. Sail Wagon; William Thomas, Benton Co., Arkansas.

Claim—1st, The combination of the spars and cargo box on the rocking shaft, thus lowering the centre of gravity and increasing the stability of the fabric, not only in this way, but by also, and as another effect thereof, allowing the sails to yield to violent gusts of thwart wind, receiving their force gradually, and spilling it more and more as they decline. 2d, The hollow wheel hub, which I have called the barrel hub, to be used for the purposes of freight, thereby relieving the axle, avoiding friction, and adding to the power of the vehicle to stand up safely against strong cross winds.

213. Locomotive Fire-boxes; W. R. Thomas, Catasauqua, Pennsylvania.

Claim—The removable lining fitting with the shell and under the permanent water spaces of the fire-box, having inwardly projecting inclined sides, and combined with the water spaces of the boiler, by means of two rows of vertical tubes entering the crown sheet, and a pipe connecting with the body of the boiler.

214. Railroad Car Journal-boxes; Philip Umholtz, Tremont, Pennsylvania.

Claim—The spring yoke bolt, in combination with the follower and packing operating in the mortise of box, in the manner described.

215. Horse Power; J. S. Upton, Battle Creek, Michigan.

Claim—The arrangement of driving wheel with the pinions and wheels, in combination with the annular wheel, with toothed gear on its internal edge and on one of its faces.

216. Clasp for the Ends of Bands of Iron; Chapman Warner, City of New York.

Claim—The construction of a clasp of any material or dimensions of the form described, with two wedge-shaped projecting tongues placed in the position, fitted with sleeves, and protected by sides.

217. Railroad Car Coupling; N. H. Wentworth and M. S. Ames, Somersworth, New Hampshire.

Claim—Combining with each latch or catch a lever, as described, and providing the latch and lever, when thus combined, with the cams and their shafts and crank-arms, for actuating them.

218. Bread-making Table; W. K. Wyckoff, Ripon, Wisconsin.

Claim—The combination and arrangement of the flour chest, the table or mould-board, the mixing tray, and the closet, as described.

219. Steering Wheel; C. T. E Blaich and P. A. Bishop, Assignors to P. A. Bishop, Elyria, Ohio.

Claim—The vertically sliding dog being secured in suitable brackets and provided with a foot-piece, pawl, and joint, as described, in combination with the spiral spring and ratchet.

220. Sewing Machines; E. S. Boyton, City of New York, Assignor to P. R. Roach, Elizabeth City, N. J.

Claim—The use use of the adjustable fulcra for controlling the feed of the needle, in combination with an annular or ring-shaped shanked wire needle, as attached directly to the crank shaft, without the intervention of a needle box.

221. Hanging Reciprocating Saws; Addison Crosby, Assignor to H. S. Stephens, Fredonia, New York.

Claim—The two jaws or plates applied to the saw, connected together and suspended within the swinging or pivoted adjustable frame, which is attached to the plates.

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222. Scythe Snaths; S. B. Batchelder, Lowville, New York.

Claim—The arrangement of the hooks, screw, ring, and plate, with slot and sliding block, constructed in the manner described.

223. Wheels for Traction Engines; Wm. Bray, Folkstone, England; patented in England, Dec. 31, 1856.

Claim—Constructing traction engines with driving wheels with blades or teeth which are capable of being protruded and withdrawn.

224. Submarine Telegraph Cable; F. J. Bridges, City of New York.

Claim—The braided or plaited coat, covering, or layer for conductors, cords, or cables, for electric telegraphic purposes, as set forth.

225. Metallic Bands for Baling; George Brodie, Little Rock, Arkansas.

Claim—Preparing the hoops or bands for tying before they are passed around the bale, by bending one or both ends of the hoops or bands, and placing in the inside of each band a suitable prepared metallic pin similar to those I have already described, around which pins the bent end of the hoops are securely pressed, for the purpose of keeping the pins in place, and also making the ends of the hoops wider or thicker as the shape of the connecting links used may require. Also, forming the connecting links like those shown. Also, bending one or both ends of the hoop or band around the outer ends of the connecting link, thereby strengthening the ends of the link, and preventing it turning or getting out of place, and the tie from untying. Also, making metallic hoops for binding bales, with a tie on each side of the bale. Also, using strips of cloth, paper, or other suitable material, under the metallic hoops, for the purpose described.

226. Fastening for Shirt Studs, &c.; Barnes Clayton, Philadelphia, Pennsylvania.

Claim—The stem rigidly fixed to the piece of the back part, the vertically moving lever plate, and the screw stem fixed to the front or ornamental part, and for the purpose of fastening the stud in place, so that it cannot be pulled out or removed therefrom, without first rotating the screw, as described.

227. Adjustable Dental Swages; E. H. Danforth, Jamestown, New York.

Claim—Forming the labial and the lingual curve of dental plates for the inferior maxillary alveolar ridge, by swaging it into form with the compound die and malleable plates in the curve of the plate.

228. Instrument for Ascertaining the Distance between itself and the Target, without Chaining; B. D. Villeroi, Philadelphia, Pennsylvania.

Claim—The addition, by means of a screw, of a tube containing the lens, and divided throughout its whole length by a vertical partition or diaphragm. At the extremity of this tube, next the eye-piece, is placed a ring containing a bisect lens, the two halves of which are equally inclined on opposite sides of the vertical plane, perpendicular to the axis of the telescope.

229. Corn Huskers; H. A. Doster, Bethlehem, Pennsylvania.

Claim—The arrangement and combination of the lever with the adjustable roller, so that when the roller is adjusted, the distance between the cam and the fulcrum of the lever will be correspondingly changed.

230. Weather Strips; John L. Faber, Sr., South Headly, Massachusetts.

Claim—1st, The bar, in combination with the parallel vibrating links, when said bar is so arranged as to fall by its own weight, and be forced against the door by the closing of the latter. 2d, The combined arrangement of the several strips and their attachments, to close up the frame sides of the door.

231. Filters; John Fitch, Seneca Falls, New York.

Claim—The combination of the cylinder, constructed and partly filled with the outside case, having the perforated plates and the filtering material disposed and arranged as described, by means of which the fluid to be filtered is made to pass through the filtering material for a greater distance, and a more perfect purification effected. I also obtain, by the same combination, a convenient mode of cooling the fluid, and also of cleansing the filter, without deranging its parts, by means of reversing its action.

232. Coffee Mills; R. B. Fitts, Philadelphia, Pennsylvania.

Claim—The cylinders, B and B, in combination with the grooved cylinder, C, and and its adjustable concave, arranged together beneath the hopper, so as to operate in the manner described.

233. Fly-wheels for Rolling Mill Machinery; Jacob Geyser, Allegheny, Pennsylvania.

Claim—Constructing the rim of a fly-wheel hollow, with partitions, in such a manner that when the heavy materials are piled in, laid in concrete, it may be held stiff and steady. Also, using any heavy and hard material along with suitable cement, to fill up such a rim.

234. Letter Envelopes; Emanual Harmon, Washington City, D. C.

Claim—The method or process of preparing letter envelopes ready ruled in the process of manufacture, in the manner set forth.

235. Dough Rolling Machine; John Hecker and Wm. Hotine, City of New York.

Claim—The combination of an inclined endless apron for receiving and returning the dough, in combination with the cylinders for rolling the dough. Also, in the above combination, the curving in of the apron around the upper roller, or the equivalent thereof, for the purpose of returning the dough to the feed table, in combination with the cylinders for rolling the dough. Also, the rotating screen, in combination with the arrangement of cylinders for rolling and working the dough. Finally, in combination with the rotating screen, the hopper and apparatus therein, for insuring a regular supply of flour.

236. Filters; A. Jaminet, St. Louis, Missouri.

Claim—1st, Circulating the water to be filtered through tiers or courses of pipes, arranged within a drum, having a current of waste steam passing through it, and then passing said water into separators for further circulation, and of depriving it of mud and other foreign matters. 2d, Arranging the separators within the steam drum. 3d, Making the apparatus self-cleansing, at intervals, by operating the valves at the bottom of the separators and filters, by levers acted on by toothed discs, ratchet wheel, and pawl, or their equivalents, actuated by the automatic movement of the clear water trough in tippling or tilting, to discharge essentially as set forth. 4th, Controlling the automatic discharging action of the clear water trough, by means of a flutterer or float, arranged therein, and serving, by connexion with an unlocking lever, a stop-piece, and catch or hook, to hold the trough from prematurely tilting.

237. Making Ornamental Chains; James Launcelott, Cranston, Rhode Island.

Claim—The method described of weaving a chain from sheet metal, by forming the base of each link into a geometrical figure, and by bending each arm longitudinally, at the same angle as one of the outer angles of the base, so that a cross-bar on the extremity of the next proceeding link shall, when bent down, bear against the angular side of two of the arms of the next succeeding link, and thereby enable the chain to withstand a strain nearly equal to the cohesive strength of the metal of which the links are formed.

238. Mode of Marking and Ornamenting Paper; Thomas Mackenzie and Albert Trochsler, Boston, Mass.

Claim—Paper for writing, printing, and other purposes, having indelible marks or designs stamped thereon, by condensing the fibres thereof by pressure.

239. Motive Power; Charles Mans, Danville, Pennsylvania.

Claim—The arrangement of the drums, wheels, pinions, fly-wheel, and sectional weights, combined as described.

240. Breech-loading Cannon; James H. Merrill, Baltimore, Maryland.

Claim—1st, The combination of the breech-piece and frame, so that the former may move back and forth, and have its bore raised up and lowered on the latter automatically, and fastened or locked. 2d, In combination with the screw for running the breech-piece forward and backward, the mechanism for lowering and raising the rear of said breech-piece.

241. Post-office Hammer Stamp; Ezra Miller, Janesville, Wisconsin.

Claim—A post-office marking stamp, which has its handle running parallel, or nearly so, with its marking face or faces.

242. Device for Equalizing the Tension of Watch Springs; J. J. Parker, Marietta, Ohio.

Claim—Making and constructing a barreled cog-wheel or drum for time-pieces, or for other purposes, so as to equalize and regulate the power of a spring, in manner set forth.

243. Envelope; S. E. Pettee, Assignor to the North American Paper Bag and Envelope Manufacturing Company, Philadelphia, Pennsylvania.

Claim—The form of envelope blank described and represented, whether cut from a continuous roll of paper, or from separate sheets.

244. Faucet; James Powell, Cincinnati, Ohio.

Claim—The arrangement of the cam, flanches, longitudinal slot, and spurs, combined in the manner set forth.

245. Rotary Engine; T. T. Prosser, Fond du Lac, Wisconsin.

Claim—A wheel with a spiral passage diminishing in size from the centre to the periphery, as described.

246. Heels for Boots and Shoes; Joseph Read, Philadelphia, Pennsylvania.

Claim—A composition heel for boots and shoes, consisting of the composition moulded into the form of a heel, with the concavity in the upper side of the same, as described, and the leather lift or bottom piece, in combination with the leather edge piece, applied and secured thereto, as set forth, the said heel being adapted for subsequent application to a boot or shoe.

247. Amalgamator; H. P. Russ, San Francisco, California.

Claim—Portable or movable cups or cones of copper, galvanized or amalgamated with quicksilver inside, or manufactured of other materials, such as wood, cast iron, &c., to be placed in holes in sluice boxes, or other apparatus used in mining for the precious metals.

248. Pump; L. B. Schafer, Baltimore, Maryland.

Claim—The arrangement for operation together of the pump, shear, link, hand brake, and piston rod, as set forth.

249. Brick Machine; J. T. Schuffenecker, Keokuk, Iowa.

Claim—1st, The safety openings, in combination with the quadrant, arranged and operating in the manner specified. 2d, The shutter operated by the fork, spring, and bar. 3d, The manner of leveling the mortar in the moulds by means of the two scrapers.

250. Instrument for Enlarging Photograph; David Shive, Philadelphia, Pennsylvania.

Claim—The arrangement of the illuminating lens in the usual open end of a photographic camera, supported in connexion with the adjustable paper-holder upon a stand, so as to operate in the manner specified.

251. Casting and Annealing Articles made of Scoria; Wm. H. Smith, Philadelphia, Pennsylvania.

Claim—1st, The construction and use of the horizontally revolving casting wheel, for facilitating the casting of slag and similar mineral products. 2d. The construction of an annealing chamber having various modes of retaining and regulating the heat therein, viz: by a series of dampers, by the construction of grooves and troughs in the walls, in connexion with the flanches and dippers of the bed, with or without the use of sand, by the devices at the ends of the wagons, and by the use of the ante-chambers. 3d. The use and combination of a series of rollers with a traversing bed, for imprinting an entire pattern of different colored figures. 4th, The construction and employment of segmental sliding moulds, as shown, or of similar character, and the mode of arranging and working the same, as described.

252. Gas Burning Stove; James Spear, Philadelphia, Pennsylvania.

Claim—The combination of the sled in the door frame with the ring, and the cylinder, and the body of the stove, constructed in the manner set forth.

253. Apparatus for Skimming the Surface of the Water in Steam Boilers; A. M. Sprague, Mobile, Ala.

Claim—The surface skimmer, constructed as described, for the purpose of removing the sedimentary water from the upper water surface of steam boilers.

254. Car Coupler; C. E. Stevens, City of New York.

Claim—The combination of the yielding support within the mouth of the aperture of railway car boxes, with one or more blocks inside and the annular flanch outside the said boxes, arranged as described, to effect the coupling of the boxes automatically, by the action of straight links and locking bolts.

255. Mode of Fastening Sheets of Paper together; E. S. Swartwout, Utica, New York.

Claim—The metallic clasp, in combination with the perforated metal plate, for fastening together legal and other documents, constructed as described.

256. Cheese Press; Charles Taylor, Little Falls, New York.

Claim—1st, Attaching the one end of the press bars to the bottom of the box, and the other end of the crank pin on the wheel, whereby I am enabled to shorten the movements of the follower, and have an eccentrically operating press, compactly arranged. 2d, The spring bed-piece and the spring acting upon the wheel, on the extreme upward movement of the follower, and thus upholding the follower.

257. Filter; Louis Tilliers, West Morrisiana, New York.

Claim—A hygienic purifier, constructed in the manner and operated as described.

258. Paddle-wheel; Nathan Thompson, Bridgeport, Connecticut.

Claim—The arrangement and combination, in the manner described, of the triangular floats with the arms to prevent the formation of the vacuum, the lifting of back water, &c.

259. Method of Securing Bits in the Stock; Wm. Tucker, Blackstone, Massachusetts.

Claim—The application or arrangement of the screws and the segmental button with respect to the bit or boring tool socket, and to operate with or on the tool, as specified.

260. Carpet Fastener; C. F. Spencer, Rochester, New York.

Claim—A carpet fastener made of a single piece of plate metal of a triangular or three-pointed form, one point serving as the shank to be driven into the floor, another point as the hook for receiving the carpet, and the third point as a head so shaped as to enable the fastener to be driven with facility into the floor.

261. Shingle Machine; W. P. Valentine, Fond du Lac, Wisconsin.

Claim—1st, Varying the rate of feed by the mechanical means set forth, so as to feed the lumber to the saw more rapidly during the first half of a cut, when the saw has the highest velocity, and slower during the latter half of a cut, in order to keep the saw constantly at a uniform velocity. 2d, The use of the two carriages, operating in the particular manner described, for the purpose of cutting alternately on both sides of the saw, thus keeping the saw constantly at work, and preventing the loss of time or power whilst the lumber is returning with the carriage to be ready for the next cut. 3d, I do not claim the concavo-convex saw, or the planes upon its surface, as separate mechanical devices; but, I claim the concave saw and the planes, in combination with the saw carriage for giving rake to the saw, and for sawing and planing shingles at a single operation. 4th, The arrangement of springs, the head blocks, and the spreaders, for alternately holding and dropping the shingle block.

262. Machine for Heading Bolts; B. C. Vanduzen, Cincinnati, Ohio.

Claim—The arrangement and combination of the adjustable spring fork rod, lever, upper lever, and heading die, as described, for the purpose of regulating the movements of the lever and die, and controlling the size given to the head of the bolt.

263. Odometer; Haskel Walker, Hartford, Assignor to self and B. P. Driggs, Fairlee, Vermont.

Claim—The peculiar arrangement of the parts thereof, by which an actuating tooth upon the hub of one of the wheels of a carriage will cause each revolution of said wheel to unerringly impart a small portion of a revolution to the shaft of the odometer, whilst the spring, by its action against the faces of the angular portion of said shaft, will accurately govern and control the movements thereof.

264. Construction of Saw Teeth; W. A. Wilson, Berlin Falls, New Hampshire.

Claim—Combining the planing with the sawing tooth, so that the cutting edge of the former shall be in rear of, and at about right angles to, the back of the latter, having the throat between, as set forth.

265. Brick Machine; William Wood, Hartford, Connecticut.

Claim—The arms, in combination with the slides, provided with the lever and tappet for operating the moulds, as described.

266. Pot-hole Covers for Cooking Stoves; L. E. Clow, Assignor to C. H. Ramson & Co., Albany, New York.

Claim—A cover or division plate, constructed of two perforated plates and the unperforated rim or ring, as set forth.

267. Iron Railroad Cars; Joseph Davenport, Assignor to self and C. M. Russell, Masillon, Ohio.

Claim—The combination with the platform or bottom of a railroad car, of a laterally and longitudinally supporting truss brace, when said brace consists of a four-sided frame, a series of transverse ties, and transverse diagonal braces, a central longitudinal skeleton or diagonally braced girder, and bearing plates or shoes, as set forth.

268. MOLE PLOUGH; W. P. Goolman, Assignor to self, S. B. Morris, and W. Hollingsworth, Dublin, Indiana.

Claim—The arrangement of devices for producing or preventing lateral curves in a drain by adjusting the presentation of the mole independently of the point of a draft.

269. WATER-CLOSET; Darius Wellington, Assignor to C. A. Wellington, Boston, Massachusetts.

Claim—The arrangement and combination of the hollow valve rod perforated at d d, cap, basin, pipe, tube, and reservoir, as described.

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270. RAILROAD CAR TRUCKS; T. F. Allen, Dyersville, Iowa.

Claim—A car truck, sustaining the weight of the car body upon the centre, in a manner to balance or keep it in equilibrium, and free from contact with the side timbers of the truck frame, whatever be the motion imparted to it, and yet provide but the one common axis or bearing for it to turn upon.

271. APPARATUS FOR DESTRUCTIVE DISTILLATION; Luther Atwood, Brooklyn, New York.

Claim—The combination of the vertical distilling tower, and appurtenances, with the condenser and the adjustable draft passage, or their equivalents, in combination, when arranged so as to use the current of heated products of combustion in its upward or natural direction.

272. HOP FRAMES; Thomas D. Aylsworth, Ilion, New York.

Claim—So hanging the main wire upon the supports, as that said supports will prevent the wire from slipping through them, should it accidentally become loose or broken. Also, in combination with the main wire, suspended as represented, the uniting thereto of the training wires by spring hooks.

273. FARM GATE; George W. Baker, Neponset, Illinois.

Claim—The slide and levers, c c, in combination with the rods, f f, levers, l l, rods, e e, and bars, arranged in connexion with the gate sections, as set forth.

274. CUSHION FOR BILLIARD TABLES; Abraham Bassford, City of New York.

Claim—Constructing the cushion of a billiard table of a metal plate, the edge of which is protected by a thin strip of india rubber, or other suitable substance.

275. CUSHION RAIL FOR BILLIARD TABLES; Abraham Bassford, City of New York.

Claim—1st, The arrangement of the cushion rail of a billiard table, in such a manner that a space is left between the bed and the rail, by securing the same to the bed by means of studs and bolts. 2d, The arrangement of the pocket bows, which are made of one piece with the rails, and secured together by a lap-joint, and which are beveled down at their lower edge.

276. HINGE FOR THE REFLECTORS OF STEREOSCOPES, &c.; Alex. Becker, City of New York.

Claim—The arrangement of the ears, one on each side of the reflector of a stereoscopic case, or attached in a corresponding manner and for the same purpose to any like part of another similar instrument, in combination with the screw.

277. MODE OF PREPARING AND MOUNTING SLATES; Hubbard Beebe, New Haven, Connecticut.

Claim—The combination of a metallic band or rim and vulcanized india rubber frame or mounting, with or without a lining of cloth, to the school slate, whether of stone, slated paper, or wood. Also, the application of the vulcanized india rubber or gutta-percha frame or mounting, substantially in the manner described, without the metallic rim, to slates of stone or other material of sufficient strength and stiffness to warrant its disuse in any case; but I deem it preferable, in all cases, to combine the two, where durability as well as noiselessness are deemed important.

278. MODE OF FASTENING SKATES; Edward Behr, City of New York.

Claim—The arrangement of the screws, b, and the screws, i, or their equivalent, in combination with the toe-cap and with the heel-strap.

279. MOLE PLOUGH; Joel Carrington, Avoca, New York.

Claim—The combination and arrangement of a replaceable pointed coulter with a continuous plate or solid standard carrying the mole, and a brace in the rear, connecting the said mole to the beam, and also to the handles.

280. METHOD OF OPENING AND CLOSING GATES BY WEIGHT OF VEHICLE; Frederic B. Betts, Brownhelm, Ohio.

Claim—The combination of the roller and its appurtenances with the levers and connecting rods, and with the gate, for the purpose specified.

281. CONSTRUCTION OF MALLETS; Lyman W. Blanchard, Whittingham, Vermont.

Claim—The mode of constructing mallets with wooden head blocks and iron fianches, and a tapering screw.

282. CARRIAGE TOPS; Pardon Boyden, Sandy Creek, New York.

Claim—The arrangement and combination of the bows, E, bars, D D, bars, H H, and seat rail, as described.

[The top of a calash, by this invention, is constructed without folding bows, the frame of the top being perfectly rigid and affixed to centres by means of a single radius bar at each side of the seat or vehicle.]

283. FASTENING SKATES; John Charlton, Newark, New Jersey.

Claim—The arrangement of the self-adjusting toe-cap, which is attached to the stock of the skate, as specified.

[In the front part of this skate a cap is placed which can be adjusted, by means of slides, to the size of different feet. It is drawn up to the toes by the straps that serve to fasten the skates to the feet.]

284. BILLIARD TABLE CUSHIONS; Hugh W. Collender, City of New York.

Claim—Making cushions for billiard tables of what is known as the soft compound of vulcanized india rubber, faced with what is known as the hard compound of vulcanizable india rubber or allied gum, united in the green or plastic state, and together subjected to the heating process for vulcanization.

285. SUBMARINE TELEGRAPH CABLE; James M. Connel, Newark, Ohio.

Claim—The introduction of the smooth surfaced wrapping between the coil and the insulating covering, and the employment of this last covering as a core for other wires.

286. CHEESE-PRESSES; Samuel Cope, Enterprise, Illinois.

Claim—Graduating the force of a hydrostatic cheese-press by drawing the water slowly through the stop-cock, as described.

287. APPARATUS FOR SOUNDING HOUSE BELLS, &c.; Joseph Corduan, Brooklyn, New York.

Claim—The arrangement of the three separate springs, in combination with the two tubes and escapement bolt, as described.

288. PILE-DRIVER; Waldo P. Craig, Newport, Kentucky.

Claim—1st, The application and arrangement of the guides attached to their upper ends by universal joints to the frame, and at their lower ends, sliding in apertures in a collar adapted to fit over the end of a pile, and follow the same in its descent. 2d, In combination with the above, the turn-table, constructed as set forth.

289 SAWING MACHINE; Wm. H. Crittenden, Grafton, Ohio.

Claim—The manner of arranging the compensating levers and rods, in combination with the straining levers, straining rod, adjustable slotted holder, and saw, arranged in the manner set forth.

290. CHOPPING-BLOCK FOR STAVE MACHINES; A. H. Crozier and Cyrus Carrier, Oswego, New York..

Claim—The grooved metallic chopping-block, constructed as described.

291. SEEDING MACHINES; F. M. Davis, Footville, Wisconsin.

Claim—The arrangement and combination of the caster wheel, lever, spring rack bar, pinion bar, pinion, rod, slide, and share, as described, so that when the bar is thrown back and lever is depressed, the bar will carry the pinion out of gear with wheel, and thus render the seed slides inoperative, while the front part of the machine will be lifted on the caster-wheel, and the share raised out of the ground.

292. PICK HANDLE; James E. Emerson, Sacramento, California.

Claim—The iron heading of a handle fitted to the under side of a pick, or other instrument, by means of a pin and hole on corresponding plane surfaces, or a swelling and hollow, corresponding to each other, and securely fastened thereto by means of a stirrup extending over the pick, or other instrument, and secured to the handle by means of a key and wedge, which will, by such combination, form a durable and permanent mode of fastening handles on picks, or other instruments, without eyes therein.

293. BEDSTEAD FASTENING; Elisha E. Everett, Philadelphia, Pennsylvania.

Claim—A plug fastening, consisting of the two plug pieces, arranged in combination with the post and rail of a bedstead, in the manner specified.

294. TANNING HIDES AND SKINS; Thomas Fergusson, City of New York: patented in France, Aug. 10, 1858.

Claim—The method described of impregnating hides or skins with the required liquid, by subjecting them to the action of a current of the liquid under a sustained and regulated pressure, after they have been deprived of air by a preliminary exhaustion.

295. STOVES; Francis Gilliland, Port Jackson, New York.

Claim—In combination with the lining and sheet metal case, the cylinder, placed within the body of the stove, and provided at its top with the register or sliding band, and a register or slide on its flanch.

296. TOOL FOR CUTTING METAL; L. F. Goodyear, New Haven, Connecticut.

Claim—The arrangement and combination of the adjustable wedges, cutters, and ring, as described.

297. GRIDIRONS; Wm. A. Green and John G. Treadwell, Albany, New York.

Claim—The check-plate attached to a stove gridiron, when the same is constructed in the manner set forth.

298. MACHINES FOR PEGGING BOOTS AND SHOES; Alpheus C. Gallahue, North East Centre, New York.

Claim—1st, Forming the rack bar of two parts, arranged so as to be lengthened and shortened, to compensate for different length of shoes. 2d, The adjustable or swinging plate, in connexion with the inclined planes, or an equivalent device, for actuating the plate. 3d, The inclined peg gauge in connexion with the peg or feed-box, so as to gauge the pegs from their lower ends. 4th, The vibrating socket in connexion with the plunger rods, arranged in the same slide bar. 5th, The bar, provided with the shoulder or bearing, and rendered capable of being operated, when necessary, by the adjustable yoke and cam, for the purpose of duplicating the row of pegs when required. 6th, The combination of the swinging bed-plate with a rack, arranged as set forth.

299. REVOLVING RETORTS FOR DISTILLING COAL OIL; James Gillespie, Freeport, Pennsylvania.

Claim—Securing the hopper-like cup in position by means of the pins, or their equivalents, surrounding the exit journal of each retort, the square-headed shaft passing through a hollow journal at the opposite end of the retort, and the external plate, as described.

300. PROTRACTOR; Charles Gordon, Washington City, D. C.

Claim—The base, the meridian limb, the vernier, the arc, and rulers, with the clamping screw, arranged as specified.

301. METALLIC PEN-HOLDER; Albert Granger, City of New York.

Claim—The holding of a pen on the outside of a metallic tube (commonly called a pen-holder,) in such a manner, by reason of pierces, cracks, and indentations, as to leave the entire length of a pen, when inserted in proper writing position, uncovered.

302. HOSE COUPLING; Smith Groom, Troy, New York.

Claim—The arrangement of the notched lugs and wedge-shaped flanches, for conjoint operation upon the outside of the fixed part and movable ring of the two halves of the coupling. And in combination with the lugs and flanches arranged upon the coupling for conjoint operation, I also claim the ratchet teeth and catch, when arranged upon the two halves of the coupling, as described.

303. PLOUGHS; Wm. J. Griffies, Marietta, Georgia.

Claim—The arrangement of the stock, forked and slotted foot, screw, shovel, brace, wedge, beam, and handles, constructed as set forth.

304. WATCHMAKERS' LATHES; Elijah Harris, Princeton, Illinois.

Claim—The standard, F, with rimmer, the standard shown at fig. 3, and the standard shown at fig. 4, with dovetail slide, the extra slide head, in combination with the standards and the slide tongs, as described.

305. CORN PLANTERS; Jacob Haynes, Cameron, Illinois.

Claim—The hinged shoe formed with a serrated plate and with the wings, in the manner described. Also, the combination of the movable seat with and supported by the hinged radius bars, and by the sliding bars, for the purpose of enabling the driver to raise or lower the front end of the machine, in the manner described.

306. ROCKER-BOXES FOR SAW SHAFTS; Rufus S. Lee and Wm. D. Leavitt, Cincinnati, Ohio.

Claim—So connecting the inner to the outer box through the medium of a spring, as that said inner box or bearing may have end motion in the outer one against the action of said spring, as described. Also, in combination with the elastic or spring connexion between the inner and outer box, the rollers for the inner box to move on.

307. GRINDING MILLS; Francis M. Hemphill, Newport, Kentucky.

Claim—1st, In combination with an adjustable bridge tree, the spindle, confined below to the tree and hinged above to the cup-formed, driving, and feeding ryne, having a hinged attachment to the runner, and enabling a discretionary increase of the stress of the runner on the grain by the lighter screw operating wholly from below. 2d, The described arrangement of the cup-formed driving and feeding ryne, gudgeons, bolts, sleeves, and metallic eye, having the described connexion with a runner and spindle respectively. 3d, The cup-formed, driving, and feeding ryne, having the described or equivalent hinged attachments to the spindle and the runner respectively, and operating as set forth. 4th, The frame, A B C, constructed as set forth.

308. INSULATOR FOR LIGHTNING RODS; Russel Hickok, Fort Edward, New York.

Claim—A lightning rod insulator made in one piece, so as to support and insulate the rod, and also leave open spaces for water to pass through it, and for air, when suddenly expanded, to escape from within it.

309. CHURN; Gardner P. Hopkins, Cabot, Vermont.

Claim—The construction of the churn so as to combine the rotary motion of the barrel with the up-and-down and rotary motion of the dashers, and so to prevent the cream from acquiring a circular motion in the process of churning.

310. MAKING MOULDS FOR CASTING; Robert Jobson, Wordsley, England; patented in England, May 3, 1856.

Claim—Constructing the table platform or bed, so that it may turn on or about necks or axes, as described.

311. HARVESTERS; Henry R. Keese, Bridport, Vermont.

Claim—1st, The employment of a hinged supplemental frame, in combination with the main frame and driving wheel, when the said frame is provided with an adjustable bearing wheel, or its equivalent. 2d, The combination of a driver's seat with the supplemental frame and driving wheel, so that, by lateral change of his position, the driver may elevate or depress the cutters or diminish the traction, and otherwise balance and govern the machine. 3d, Hinging the supplemental frame to the main frame, as set forth.

312. BREECH LOADING FIRE ARMS; Edw. Lindner, City of New York.

Claim—1st, The method described for operating or closing the breech, and forming a tight joint at the junction of the barrel with the breech, by the employment of a screw ferule or sleeve, fitting an outer screw thread on the barrel, and provided with a projecting annular flanch for grasping and releasing the breech, and for drawing the same backwards and forwards in the direction of the barrel, to or from the rear end thereof, upon said screw-threaded sleeve. 2d, In combination with a movable box within the breech, constructed as described, the packing thereof by means of asbestos, or its equivalent. 3d, Locking the screw-threaded sleeve that operates the breech, by forming the pivoted lever which serves to turn said sleeve with an eccentric or cam, arranged to act upon a locking pin by pressing down said lever after the breech is drawn tight, as set forth.

313. PORTABLE WRITING DESKS; Wm. H. Lochman, York, Pennsylvania.

Claim—The mode and manner of uniting the different parts of a writing desk by hinges, or their equivalent, so as to admit of its being folded up into a comparatively small space.

314. LIFE-BOAT; Matthias Ludlam, Fair Haven, Vermont.

Claim—Providing the exterior of the boat with adjustable side-floats, constructed and hung, or arranged to operate in, or at different fixed positions or distances, to or from the sides of the boat. Also, providing either float, arranged along the outsides of a boat, with an open or trellis-work railing made to project below the float.

315. EXPANDING AUGER; Charles Meyer, Fond du Lac, Wisconsin.

Claim—An expanding auger, constructed and operated substantially as described.

316. CORN PLANTERS; John G. Mitchell, Collington, Maryland.

Claim—The combination of the swinging hopper, constructed and arranged as described, with the adjustable coverer and dropping tubes.

317. HARVESTERS; J. A. Moore and A. H. Patch, Louisville, Kentucky.

Claim—1st, The enlargement of the curved slots of the standards, as set forth. 2d, The arrangement relatively to each other of the vertically perforated curved stop bar, slide, and lever, for the purpose set forth.

318. PRESERVE CANS; Samuel Morritt, West Pennsboro', Pennsylvania.

Claim—The covering of fruit cans by means of the concave cover, when the same is constructed as described, and retained in place solely by atmospheric pressure.

319. APPARATUS FOR CLEANSING BRISTLES; Henry W. Mosher and Joseph A. Conboie, City of New York.

Claim—The rotating bristle clamps placed within a cylindrical box or case provided with diagonal plates, and used with or without the brush and soap bar, or other cleansing substance, as set forth.

320. HAY MANGERS; John Packer, Philadelphia, Pennsylvania.

Claim—Combining with a hay manger a falling rack, to prevent the horses from pulling out and unnecessarily wasting the hay therein.

321. VENTILATING VAULT COVER; John Patrick, City of New York.

Claim—The perforated plate and gutter, in combination with the metallic roof, ceiling, or walk, for forming a ventilating space and catching any water of condensation, in the manner specified. And, in combination therewith, the ventilating pipe, as specified.

322. MACHINE FOR BENDING TIRE; Wm. Patterson, Constantine, Michigan.

Claim—1st, Connecting the clevis to the lever and segment in such a manner that the lever will cause the clevis to grasp and release its hold on the bar to be bent, independently of and before said segment commences to move. 2d, Providing the outer end of the clevis with an arm, so arranged in relation to the circumference of the segment as to bear against the outer side of the tire, and support it (while being bent) above the end of the segment, thereby preserving the circle of the tire by preventing it from springing back during the descent of the lever. 3d, Making the clevis adjustable for the purpose of adapting it to the use of different sized segments in the same machine.

323. HOOP MACHINE; Henry C. Peirson, Philadelphia, Pennsylvania.

Claim—The arrangement of the series of bending rollers, or their equivalents, in rear of the cutter, or its equivalent, so as to operate upon the hoops in the manner specified, as the said hoops pass between them directly from the said cutter.

324. RAILROAD COUPLING CHAIR; R. S. Potter, Chicago, Illinois.

Claim—The use of two wedges or keys, in combination with a railroad chair, when the outer lip of said chair is overhung in the manner described, and its inner surface is of a conoidal form, as specified.

325. SEED PLANTERS; D. R. Prindle, Bethany, New York.

Claim—1st, Hinging the frame that carries the seeding devices, and the beams that carry the furrow opener and coverer to the axle. Also, in combination with the axle and hinged frame and beams, the tongue and lever, for raising and lowering or controlling the planting and covering devices. Also, the adjustable hinged clevis irons, arranged as set forth. Also, the combination of the curved spring plates and spring, as applied to the seeding wheels or cylinders, for the purpose explained.

326. CLOTH FRAMES; Daniel Read, Hamilton, New York.

Claim—The combination and arrangement of the standard with the arms, the standard, i i, and braces, as specified.

327. MACHINERY FOR FILLING LOOM HARNESS NEEDLES; L. L. Reynolds, Manchester, New Hampshire.

Claim—The hooks, or the equivalent thereof, for depositing the twine or cord upon the outer sides of the score of the needle, when combined with a device for delivering the twine or cord to said hooks. Also, in combination of the intermittent rotating oval-shaped pin with the cam, or their equivalents, for depositing the twine or cord evenly around the end of the needle.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On a Universal Printing Press.** By T. J. SILBERMAN, Jr.

A press on this principle, and adapted to all kinds of printing, has been patented by Mr. Silberman, pupil and assistant in physics to the late M. Savart, and to M. V. Regnault, at the College of France.

Pascal's law is this: "Whatever be the amount of pressure brought to bear upon any point in a contained fluid mass (whether the fluid be a liquid, or steam, or gas), this pressure is distributed with perfect and entire equality among all parts of the mass, and consequently with perfect equality over all parts of the surface of the vessel which contains the mass;" so that if this vessel or a portion of it be pliable and elastic, it will communicate the same pressure which it receives to paper, cloth, or any other similar substance, laid upon an unyielding engraved surface. And the invention consists in printing by thus applying the pressure of a fluid to a yielding surface laid against an unyielding engraved surface; and this whether the surface printed be that of the vessel itself, which thus becomes the press,—or whether it be communicated to another interposed yielding surface from the pliable and elastic side of the vessel, so as to print plane, curved, or angular surfaces,—or whether the material to be printed be paper, felt, textile fabric, caoutchouc, leather, bladder, ceramic paste, or glass, crystal, or enamel softened by heat,—or whether it be used for the purpose of peripheric printing, as in the printing of terrestrial and celestial globes, of vessels of glass and earthenware,—or as a modification of the presses in use for other kinds of printing.

* From the London Civ. Eng. and Arch. Jour., December, 1858.

The application of this principle to the peripheric printing of globes, and of vessels of glass and earthenware, is the subject of a separate paper. At present let us consider merely its application to printing upon plane surfaces, as well as the different modifications it admits of, so as to suit the different kinds of printing; and lastly, of its peculiar advantages over other methods.

The following are some of the methods in use for the practical application of the principle:

1. A strong shallow basin of tough metal is required, with a triple stop-cock at bottom, admitting at pleasure the sort of fluid intended to be used, whether it be atmospheric air, steam, or (when great pressure is required) water, with hydraulic pressure. This basin is filled with water, and covered by a tympan formed of a sheet, or of several sheets thick, of caoutchouc firmly clasped at the edges in an iron frame. A movable plate of iron strengthened by stays is attached by strong hinges to one of the edges of the tympan frame. This plate, when shut down upon the surface of the tympan, forms the unyielding portion of the press, and supports the engraved plate against the substance intended to be printed, which receives by means of the tympan the pressure produced upon the water at the bottom of the basin.

In order to retain this plate firmly in its place upon the tympan, its edges as well as those of the basin should be beveled in such a manner as to lock the whole way round in a collar with a corresponding groove; this collar opens and closes upon the edges the whole way round by means of two hinges and wide-threaded strong screws, or else by means of a cam or eccentric lever lock. A very simple contrivance compels regularity in the proceeding, and prevents accidents, by locking the stop-cock, and preventing the admission of pressure into the basin, until after the plate shall have been shut down and firmly locked upon the tympan.

The engraved plate may either be permanently fastened upon the iron plate, or it may be run into its place in a groove, so as to admit of being easily removed and replaced after each impression, as in the case of copperplate printing.

When it is intended to print paperhangings or cloth with dies, an iron frame instead of the solid plate above described is attached to the hinges; a strong iron axle passing through gudgeons on opposite sides of the frame carries a panel fitting into the frame, and upon this panel the die is fixed. The panel thus revolving completely on the axle at the same time that the frame is raised upon its hinges to a vertical position, admits of the face of the die being alternately brought in contact with the tub, when it is charged with color, and with the surface of the material intended to be printed.

2. Another form of the press is one in which the tympan is movable upon hinges, and fastens down upon the plate, which in this case is the fixed part of the press, and upon it the die is laid. In lithography or typography there must of course be a hollow in the plate corresponding to the thickness of the stone or type used.

This was the form adopted for the first experiment with the press,

its tympan consisted of two sheets of vulcanized caoutchouc fastened to the basin, and secured by strong screws; the tympanum and the plate, instead of being locked together while the pressure was on by means of the collar above described, were kept together at one end by the hinges, and at the other by a cam or eccentric lever lock, working from an iron arch like a common letter-copying machine, and to which two movable claws are attached, which, when the lever is worked, grasp and secure the ends of a strong bar across the centre.

3. It may sometimes be desirable to place the press vertically, notwithstanding the slight, and in fact almost imperceptible difference in the pressure at the top and at the bottom of the basin, and which is produced by the column of water in the basin itself. When air is used this inequality is absolutely imperceptible, but on account of the great compressibility of air a much larger quantity of air must be admitted than when water is used; for instance, if the basin is one metre square and one millimetre deep, and consequently holds one litre, it will require one litre of air to produce a pressure of a single atmosphere, and ten litres to produce a pressure of ten atmospheres.

The vertical position is particularly well suited for very large plates, say five or six feet square; the copperplate can if necessary be heated from behind, and the workman can apply the ink in a standing posture. The press in this case would open like a door, and large presses thus arranged would occupy but little space, would be easily worked, would render the application of the ink less fatiguing, and would save rent in office space, for six vertical presses take no more room than two horizontal presses. In this way the printing of very large maps will become not only possible but cheap.

As to the purposes to which it can be applied:—1. It is equally suitable to all kinds of ordinary printing, whether copperplate, lithography, typography, paperhangings, or wood engraving, for it fully admits of the depth of shade in certain parts of the engraving being modified according to taste, without altering the engraving by the usual contrivance of folds of paper cut out so as to throw the part into suitable relief. 2. It is peculiarly suitable for polychromic printing, whether typographic, lithographic, or copperplate, and the pressure being only in a vertical direction, the paper or cloth is not liable to be altered in size or form by the pressure, and admits of accurate fitting to the guide pins as often as the number of colors used may require. 3. It is equally suitable for printing upon all sorts of material, whether paper, cloth, ceramic paste, felt, leather, or caoutchouc. 4. It prints with a single impression very much larger plates than it has heretofore been possible to do, and it ensures the color being uniform over the whole surface. 5. It admits of being used for stereotype and other casts from ordinary printing type, and does not require that frequent touching with the brush which wears away the characters so quickly.

As to the pressure:—1. The pressure being that of a fluid communicated through a uniformly yielding surface, will be absolutely equal at every point of the surface, consequently there will be no danger of partial pressure on the plate, nor need there be a pressure upon any

part of the plate beyond what is necessary, so that the maximum result is thus obtainable with a minimum of pressure. 2. Any amount of pressure required can be easily obtained. 3. The amount of pressure can be ascertained with precision (for instance, by Bourdon's metallic manometer), and diminished or increased to the exact extent which may be required. 4. Perfectly plane surfaces are no longer the only surfaces capable of being printed. 5. Convex or concave surfaces can thus be printed.

As to make, form, and size:—1. The press is extremely simple in its construction; almost all the pieces are cast exactly as they are used, and require very little fitting. 2. It can be made of any strength required. 3. It requires no troublesome alterations when the purpose for which it is used is altered. 4. It fits in a very small space, being only four or five inches wider than the printed sheet, whereas the presses hitherto in use are at least four times wider than the printed sheet. 5. It thus admits of being worked in a small and comparatively inexpensive office. 6. Its size being so small, a printer can have several presses of different sizes in his office, so as to be no longer forced to use his large presses for small sheets. 7. It is easily taken asunder and moved. 8. It is on this last account, and the almost impossibility of breakage, admirably adapted for exportation.

As to its working:—1. It requires hardly any effort, and entirely dispenses with the severe labor which the winches and pedals of the present lithographic press requires,—with the rolling of copperplate printing,—with the difficulty of charging the blocks with color, as well as with the danger of working the huge lever of the ordinary press in printing paperhangings; and as it requires less exertion on the part of the workmen, it gives them more time to attend to the quality of the work, and thus tends to elevate their character. 2. A much greater number of impressions can be taken in a given time than was possible heretofore. 3. The manner of using the press can be learned in an hour. 4. No modification of the press, or any of its parts, is necessary when a change is made in the size of the sheet, or otherwise in the nature of the work to be printed. 5. The impression is uniformly even and invariably successful. 6. There is no longer any danger of distorting nor of lengthening by rolling out the plates in copperplate printing,—nor of breaking the lithographic stones by the uneven pressure of the scraper. 7. The simplicity of the contrivance for locking the press, and for admitting and shutting off the pressure, renders all mistakes impossible. 8. There is no part of the press which is expensive from excessive wear and tear; and even when worn out, both the caoutchouc and the metal have a considerable value as raw material.

As an investment, the great simplicity of the machinery, and the small expense of fitting, will allow the press to be sold extremely cheap.

As to the sort of pressure to be used,—steam pressure may be adopted, or the pressure of expanded or condensed air, the hydraulic press, the screw, the cam, or the eccentric or knee lever lock. If steam is used, the waste heat will warm the plates in copperplate printing,

and will thus get rid of the charcoal dust, so injurious to the health of the workmen.

The expenditure of water or steam may be estimated by considering the surface of the caoutchouc as the surface of a piston, and its depression joined to that of the printed surface as the stroke of the piston; consequently, when the basin is one metre square, there is an expenditure of one litre of air or water for each millimetre in the depression of the surface.

Water appears on the whole the most desirable agent, on account of its non-compressibility and of the small quantity required in order to produce very considerable pressure, as also on account of its non-expansibility, which prevents the possibility of an explosion, for if any breakage takes place the water simply runs out. In experiments which were made with a pressure of from 20 to 30 atmospheres, before perfecting the press, the vessel repeatedly burst with no greater injury to those engaged than a few splashes on their clothes.

Coloring Matters.

In view of the excitement which has recently ensued upon some reported cases of accidental poisoning from the use of arsenical colors on stuffs and paper-hangings, M. Salvetat calls attention to the possibility of producing cheap and permanent greens, pinks, and violets from common metals. He enumerates the following:

Chrome-greens—Prepared by calcining together the sesqui-oxide of chromium, hydrated alumina, and the carbonate of cobalt in an oxidizing atmosphere. The proportions vary with the color desired. Blues may also be obtained in the same way.

Hydrated Oxide of Chrome.—This magnificent color has long been used by the painters under the name of *emerald green*. It is also sometimes called *Pannetier-green*, from the name of its introducer. The following mode of preparing it has been patented in France by M. Guignet:—Calcine, carefully, to redness a mixture of bi-chromate of potassa and crystallized boracic acid; a green mass is obtained which is a borate of chromium and potassa. In contact with water this salt decomposes; boracic acid dissolves, and the hydrated oxide of chrome remains precipitated. The proportions recommended are 10 parts by weight of the crystallized acid ($BO^3 \cdot 3HO$,) to 3 parts of bichromate $KO \cdot 2C \cdot O^3$, which by theory should give 2 parts by weight of the hydrated oxide.

The tone of the color may be varied by the mixture of alumina. The tone of the emerald green corresponds to green 4, 12th tone of the 1st chromatic circle of M. Chevreul.

Cobalt-Pink, and Violet.—When a solution of a cobalt-salt is precipitated by the phosphate of soda, we obtain a pink-salt of a very beautiful tint, which, when simply dried in the air, corresponds to 1st red-violet, 5th tone of the 1st chromatic circle of M. Chevreul. It is known that under the influence of heat the oxide of iron takes a tint

which varies from orange to blue-violet, according to the temperature to which it has been exposed. The phosphate of cobalt presents a similar property; and according to the temperature to which it has been exposed, its tone varies from red-violet to the 2d blue-violet. We may thus obtain any intermediate tint from the 3d violet-blue to the 5th violet and red-violet. The violet, 11th tone, corresponds to the fused phosphate of cobalt. The 4th violet-blue, 10th tone, corresponds to the aluminate of cobalt and chrome. These tints will be purer in proportion as the heat has been uniform throughout the whole mass.

As the oxide of cobalt may now be obtained at a reasonable price, it is to be hoped that these new mineral colors may be serviceable for printing on stuffs and paper, and especially for the preparation of fine colors for painters.

Nickel-yellow.—The phosphate of nickel, which, when merely dried at ordinary temperatures, is of a greenish-white color, becomes yellow by exposure to a red heat. This may give us a new fixed yellow for similar purposes.—*Academy of Sciences of Paris, Feb.* 7, 1859.

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*On an Expanding Pulley for Obtaining Variations in the Speed of Machines with facility.** By JAMES COMBE, Belfast.

A pretty correct idea of this pulley may be formed by supposing two cones cut with radial spaces alternating with solid parts, so that the solid parts in one may slide freely into corresponding spaces in the other, in the direction of a common axis. The sizes of these radial sections are regulated so that when the two cones are put together they form a grooved or V pulley, the diameter of which varies according to the position which the cones occupy with regard to each other. This will be at once apparent by an inspection of the engravings. It will also be seen that any desired amount of variation in size may be got, and this without involving the necessity of occupying a large space. This change in size is made by pressing the one into the other, which can easily be done whether the pulley be in motion or at rest. The value of the property of giving readily any amount of change in size will be made evident by a comparison of the results obtainable by a pair of common cones and a pair of expanders of similar dimensions, and giving the same extremes of speeds.

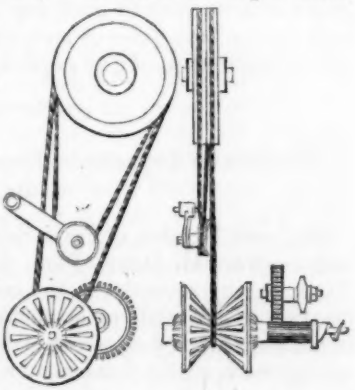
A range from 1 to 4 in diameter (or more if necessary,) is easily obtainable in the expanders, and, supposing the one which drives to have a speed of 80 revolutions per minute, and that it be set at 4 ins. diameter, and the one which is driven to be set at 16 inches diameter (the corresponding position), the speed of the latter will be one-fourth of 80, or 20 revolutions per minute.

When the driver is changed to 16 inches in diameter, and the driven to 4 inches, the speed of the driven shaft will be increased to 320 revolutions per minute.

The changes between these extremes (20 and 320,) may be of any

* From the London Mechanics' Magazine, October, 1858.

extent or per centage on the speed, and they can be made as gradually as is desired without stopping. For comparison with this, take a pair of common cones, having the same extreme diameters, and having steps of two inches, which is not more than usual. When the driving strap is changed from the steps on the cones which give the slowest speed (that is, 20 revolutions per minute) to the next steps, which is the smallest change that can be made, the speed of the driven is increased to 34 revolutions per minute, that is, 70 per cent. on the former speed. The change to the next steps makes the speed of the driven 53, and the increase here is 56 per cent. The third change increases it to 80, or 51 per cent.; the next to 120, an increase of 50 per cent.; then to 186, by an increase of 55 per cent.; and, lastly, to 320, by an increase of 72 per cent. All these changes in speed are great, and, although in practice mechanics have become accustomed to them, and don't think of the loss, it is quite clear that a great waste of time must result from not being able to get smaller changes readily. For instance, suppose that a lathe or boring machine has a piece of work in it of a diameter that would require a speed between any of the speeds which the steps of the common cones give, but which will not bear the whole step; it is quite clear that in this case a loss of time and work equal to 50 or 60 per cent. may take place. To get over the difficulty attending the use of common cones, some tool-makers use two pairs of driving pulleys on the counter shaft, which of course doubles the range of the cones; but this is a cumbrous arrangement, and is still very far from giving what is necessary or desirable. There are many machines in which a variation of speed is desirable, and would be used if it could be got readily; but there is often such a loss of time involved in making a change that very much slower speeds are used rather than take the trouble or incur the delay of making that change. The common cones referred to are not by any means an extreme case; on the contrary, it is quite common to make the steps even greater, and, if the number of steps be less and the extent of the range smaller, there is of course a corresponding diminution in the adaptability of the machine to different purposes.



The expanding pulley was first brought out for the purpose of giving the varying motion to the bobbins in flax and tow roving frames, to which it is applicable with great advantages, from the accuracy of its action and the small space which it occupies. By its use a very simple and correctly working machine is got, capable of making bobbins either in the ordinary way or in cops. It is equally applicable to the heaviest and the lightest frames.

The cop is from a tow roving frame, and is made of rove weighing

1 lea (or 300 yards) to the lb. The bobbin is filled with flax rove of 40 leas (or 12,000 yards) to the lb.

On the machines on which this bobbin and cop were filled only one expander is used, and the band is kept at the necessary tension either by making the expander swing in a frame or by the use of a stretching pulley.

A very simple mode of applying a stretching pulley is to make the pulley, which does not vary, with two grooves or V's, and pass the band twice round it, putting the expander in one fold, and the stretching pulley in the other. These arrangements are applicable to many other purposes. Where two expanders are used, one to drive the other, it is not necessary to have any stretching pulley, but simply to connect one or both sides of each pulley with levers, so that they may be moved simultaneously as required.—*British Association*, 1858.

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*Electro-zinc Deposits on Engraved Copperplates.** By HENRY BRADBURY.

M. Louis Figuier, of Paris, through the instrumentality of my friend and *confrére* M. Henri Plon, the eminent printer and publisher of Paris, having recently, in the columns of *La Presse* newspaper, made mention of my mode of surfacing engraved copperplates with a coating of pure zinc by electro-metallurgical means, for the purpose of protecting such plates from wear while printing, and which coating can be removed and renewed at pleasure with facility, and without injury to the engraved plate, I beg leave to introduce the particulars of my mode, for the benefit of those interested in extending the application of the galvano-plastic art.

To obtain a deposit of pure zinc capable of printing from 1500 to 2000 impressions, or more, before requiring to be removed and renewed, I have recourse to a combined solution of chloride and cyanide of zinc, prepared as follows:—

CHLORIDE OF ZINC SOLUTION.—In a suitable vessel dissolve one part chloride of ammonium in eight parts water; place in this a porous cell containing the same solution and a copperplate, which attach to the zinc of a Smee's battery, and in the outer cell place a plate of spelter, which attach to the silver of the above battery for 48 hours.

CYANIDE OF ZINC SOLUTION.—Dissolve ½lb. of cyanide of potassium in twelve parts of water; then add as much chloride of zinc as the solution will take up.

Mix these solutions together in equal parts; use a zinc positive pole and one of Smee's compound batteries, intensity arrangement, charged with one part of sulphuric acid to twelve of water.

In from 45 minutes to an hour a deposit of the most beautiful lustre will be obtained, capable of yielding from 1500 to 2000 impressions, and even more, according to the experience of the manipulator.

Whitefriars, February 3, 1859.

* From the Journal of the Society of Arts, No 324.

*Electro-zinc Deposits on Engraved Copperplates.** By F. JOUBERT.

Your last number contains a letter from Mr. Henry Bradbury, describing a process for covering an engraved copperplate with a deposit of zinc, in order to protect it from wear while being printed, and it is stated such a deposit will yield from 1500 to 2000 impressions.

This is an imitation of the process for covering engraved copperplates with iron before sending them to press, originally introduced in Paris under the name of "Acierage," for which I hold an English patent, taken out last year, and which process I had the honor of describing before a full meeting of the Society of Arts, in a paper read on the 24th of November last.

It is a well known fact that zinc, in a pure state, is even softer than copper, and, moreover, it has a natural tendency to retain the printing ink instead of giving it off freely, as steel and its basis, iron, will do. Every printer who has had zinc plates to work from can testify to the very limited number of good impressions which are obtainable from zinc plates, sometimes used for maps, plans, &c.; whereas the metal I use, as described in the specifications of my patent, is capable of yielding 10,000 impressions and upwards before the first coating shows signs of wear. This was exemplified at the last meeting of the Graphic Society, where I exhibited several engraved copperplates, forming part of a work shortly to be published, some of which had already produced 10,000 impressions, and this with one coating, without any perceptible difference between the first and the last impressions which I had sent with the plates.

Such a result will, I hope, establish in a satisfactory manner the superiority of the one metal over the other; for zinc cannot by any possibility compete with the harder metal—iron, which seems to acquire, by being deposited through galvanic agency, a power of cohesion and resistance much beyond that which pure iron possesses, and very nearly equal, for printing purposes, to the best steel used in the trade for making steel plates.

Porchester-terrace, February 10, 1859.

* From the Journal of the Society of Arts, No. 325.

Action of Hydrogen Gas on Metals.

M. Bekatoff, operating in the laboratory of M. Dumas, has discovered that:—

1. Common hydrogen, either as a gas or dissolved, displaces certain metals from their solution in acids. The metals with which he succeeded were silver and mercury.

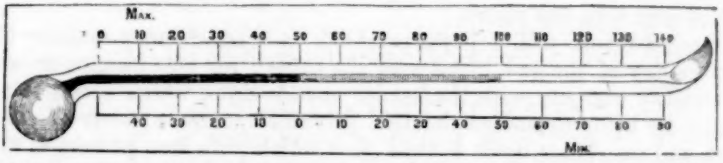
2. This action depends on the pressure of the gas and the dilution of the salt, or in other words, on the relative chemical mass of the reducing body.

3. It is probable that at higher pressures, the experiment will succeed with other metals.—*Academy of Sciences of Paris, February* 28, 1859.

*Notice of another New Maximum and Minimum Mercurial Thermometer.** By JOHN G. MACVICAR, D.D., Moffat.

The maximum and minimum thermometer described by me at page 221, volume x, of this journal is not the only one in which mercury may be used to give the minimum as well as the maximum for any interval of time between two successive adjustments. A more elegant instrument, at least for meteorological purposes, may be constructed thus:—

Let a mercurial maximum thermometer of the ordinary Rutherford's construction be taken, and let 50° or 60° in length of a suitable liquid be introduced into the stem immediately above the mercury, and into this liquid let two indices be inserted, first, one which shall obey the magnet, as in Rutherford's maximum thermometer, and then one of enamel, as in Rutherford's minimum. Let the instrument be then sealed in the usual way, and on the plate let two scales be engraved, one taking its points from the top of the mercury for a scale of maximum temperatures, and the other taking its points from the top of the liquid for a scale of minimum temperatures, and the instrument is completed. To prepare for an observation, let the enamel index be brought, as in Rutherford's minimum, to the top of the liquid: then holding or placing the instrument horizontally, let the steel index be brought by the magnet to the top of the mercury. The thermometer is now fit for use. It is obvious that the upper end of the enamel index will give the minimum and the lower end of the steel index the maximum temperature since the last adjustment.



I had contrived this instrument before that described at page 221, volume x, but passed from it at the time, in apprehension of not finding a liquid suitable for the suspension of the minimum index. Spirit and analogous liquids tend to diffuse with the mercury when in a horizontal column, and each breaks the continuity of the other. And though when this occurs, the instrument still remains a good mercurial minimum, yet it destroys its completeness and beauty.

I am now satisfied, however, that a liquid having no diffusive tendency or chemical action between it and mercury, as also a sufficiently low freezing point and high boiling point, may be found. In fact, between twenty and thirty years ago, Mr. Adie, the optician in Edinburgh, merely to prevent oxidation in the tubes of Rutherford's maximum thermometer, introduced above the mercury, naphtha; and I saw the other day one of these thermometers, which, during that long interval had preserved the mercurial column unbroken, and the steel index pure and all right. It is certain, however, that it is not every kind of liquid that passes in commerce under the name of naphtha that will do so. But the

* From the Quarterly Journ. of the Chem. Soc., July, 1858.

fact that a hydrocarbon was found which has continued to function well for a quarter of a century, shows that a suitable liquid may be found.

Residing, however, as I do, among the mountains of Scotland, far away from all facilities for accurate experiments, I must leave further determinations to those who are more favorably situated for such inquiries.

For the Journal of the Franklin Institute.

Particulars of the Steamer Pei-Ho.

Hull built by Thomas Collyer. Machinery by the Morgan Iron Works, New York. Owners, J. M. Forbes & Co. Intended service, China Seas.

HULL.—

Length on deck,	225 feet.
Breadth of beam, (molded,)	32 "
Depth of hold,	9 "
" to spar deck,	16 "
Frames—*molded*, 12 inches, *sided*, 14½ inches; apart at centres, 29 inches, and strapped with diagonal and double-laid braces 4×½ ins.	
Keel—Depth, 9 inches.	
Independent steam, fire, and bilge pump—one—and boiler.	
Bulkheads—two.	
Draft of water, forward and aft,	11 " 6 "
Tonnage, 1110.	
Area of immersed midship section at load draft of 11 ft. 6 ins., 315 sq. ft.	
Masts, two.—Rig—Brigantine.	

ENGINES.— Inclined oscillating.

Diameter of cylinder,	52 inches.
Length of stroke,	8 feet.
Maximum pressure of steam, 25 lbs.	
Cut-off, variable.	
Maximum revolutions at above pressure, 22.	

BOILERS.—Two—Return tubular.

Length of boilers,	18 feet.
Breadth "	12 " 6 inches.
Height " exclusive of steam chimney,	12 " 6 "
Number of furnaces— six.	
Breadth of "	3 " 8 "
Length of grate bars,	7 "
Number of tubes, { above 336. below 32.	
Internal diameter of tubes, { above 3½ " below 16 ins., 10 ins. and 14 "	
Length of tubes, { above 12 ft. below 3 ft. 11 "	
Diameter of smoke pipe,	4 feet 10 "
Height "	32 "

PADDLE WHEELS.—

Diameter overboards,	28 feet.
Length of blades,	8 "
Depth of "	18 inches.
Number " 24.	

Remarks.—Cabin and state-room on spar-deck. Floors filled in solid. Date of trial, April, 1859. C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Indianola.

Hull and Machinery by Harlan, Hollingsworth & Co., Wilmington, Delaware. Owners, Mora Bros., Navarro & Co. Intended service, New York to Havana.

HULL.—

Length on deck,			151 feet.
" at load line,			149 "
Breadth of beam, (molded,)			26 "
Depth of hold,			9 " 9 inches.
" to spar deck,			16 " 9 "
Length of engine room,			40 "

Frames—molded $3\frac{1}{2} \times \frac{3}{4}$ and $\frac{7}{8}$ inches = $20\frac{1}{2}$ to 15 inches apart from centres. Sketch of shape ⌊. Depth $3\frac{1}{2}$ ins.

Strakes—10 strakes of plates from keel to gunwales.

Diameter of rivets $\frac{3}{4}$ inch. Apart, $2\frac{1}{8}$ ins. Single riveted.

Thickness of plates, $\frac{3}{8}$, $\frac{1}{2}$, 7-16ths and $\frac{5}{8}$ inch.

Cross floors—10 in number, 18 inches high, with $2\frac{1}{2} \times 2\frac{1}{2}$ L iron on top.

Bulkheads, three.

Keelsons—8 fore and aft—main, side, and bilge.

Keel—depth 6 inches.

Draft of water at load line,	forward,		7 feet $1\frac{1}{2}$ inches.
	aft,		8 " $4\frac{1}{2}$ "
Tonnage,	Hull,	358 60-95ths.	
	Engine room,	74 10-95ths.	
Area of immersed section at load draft,			160 sq. feet.
Speed in miles,	with tide,	13.	
	against tide,	$9\frac{1}{2}$.	

Masts, two.—Square rig fore—Lugsail, aft.

ENGINE.—One—Direct acting—Condensing.

Diameter of cylinder,		32 inches.
Length of stroke,		2 " 4 "
Pressure of steam,	27 lbs.	
Cut-off,	half stroke.	
Maximum revolutions at above pressure,	70.	
Weight of engines,	64,000 lbs.	

BOILER.—One—Drop return flue.

Length of boiler,		20 feet.
Breadth "		9 " 6 inches.
Height " exclusive of steam chimney,		8 " 6 "
Weight " with water,	62,000 lbs.	
Number of furnaces,	2.	
Breadth "		4 " 1 "
Length of grate bars,		6 "
Number of flues,	above 16.	
	below 6.	
Internal diameter of flues,	above $8\frac{1}{2}$ ins.	
	below 2 of 21 ins., 2 of 17 ins., and 2 of 16 inches.	
Length of flues,	above 14 ft. 9 ins.	
	below 9 ft.	
Heating surface,		1077·26 sq. ft.
Diameter of smoke pipe,		3 " 11 "
Height " from grate bars,		38 " 6 "
Consumption of fuel per hour,	$\frac{3}{4}$ ton.	

PROPELLER.—

Diameter of screw,		8 feet 6 ins.
Length of "		3 " $8\frac{3}{4}$ "
Pitch of "		15 " 5 "
Number of blades,	4.	

Date of trial, March, 1859. C. H. H.

Objects Rendered Visible in a Fog.

In a communication from Sir Henry* Brewster to the Academy of Sciences of Paris, he says:

"Whilst I was studying the polarization of the atmosphere, I observed this remarkable fact, that when distant objects are rendered indistinct by the interposition of a light fog, a part of their definiteness may be restored by looking at them through a Nicol-prism, which stops all the light which the fog has polarized in a plane passing through the sun, the object, and the eye of the observer. The objects thus made more distinct and visible, were seen through that portion of the fog in which the polarization of the reflected light was at a maximum.

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NOTE.—We remember to have seen somewhere, and to have published some years ago, a somewhat similar statement as to the efficiency of a simple plate of red glass to effect this same object. Will not some one who has a good opportunity, try this very simple experiment, which might be of great importance in preventing collisions upon our rivers and harbors during heavy fogs. ED. JOUR. FR. INST.

*The Comptes Rendus, both in the title and in the contents, says Sir Henry, but the nature of the communication itself, as well as its place among those of the members and correspondents of the Academy, show that it is really the distinguished optician, Sir David Brewster, who is the author of the article.

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*The Discovery of the Composition of Water.**

Mr. Bennett, of the British Museum, has addressed a letter to Sir Benjamin Brodie, Bart., which contains indisputable evidence in favor of Cavendish's claim to the discovery of the composition of water. The evidence was discovered by the late Robert Brown, Esq., and is not derived from any unpublished document, but forms part of a section of De Luc's "Idées sur la Météorologie," which, although specially entitled "*Anecdotes Relatives à la découverte de l'Eau sous la forme d'Air*," appears entirely to have escaped the notice of those who have advocated Cavendish's claims. It is the more conclusive as coming from De Luc, the "*ami zélé*," as he justly terms himself, of Watt, and who, in relation to this question, believed himself "à portée d'en connoître toutes les circonstances."

The testimony of De Luc is as follows:—Vers la fin de l'année 1782, j'allai à *Birmingham*, où le Dr. Priestley s'étoit établi depuis quelques années. Il me communiqua alors que, M. Cavendish, d'après une remarque de M. Warltine, qui avoit toujours trouvé de l'eau dans les vases où il avoit brûlé un mélange de *l'air inflammable* et *d'air atmosphérique*, s'étoit appliqué à découvrir la source de cette eau, et qu'il avoit trouvé qu'un mélange *d'air inflammable* et *d'air déphlogistique* en proportion convenable, étant allumé par l'étincelle électrique, se convertissoit tout entier en *eau*.—Je fus frappé au plus haut degré de cette découverte."—*Idées sur la Météorologie*, Tome 2, 1787, pp. 206–7.

The italics and inverted commas are De Luc's own.

In this communication, made by Cavendish to Priestley, the theory

* From the London Athenæum, Feb., 1859.

of the composition of water is clearly indicated. The two gases—known to have been hydrogen and oxygen—were mixed together *in due proportion*, and by means of the electric sparks were *entirely converted* into water. Referring to one of Cavendish's experiments, as recorded in his Journal, Lord Jeffrey, the most candid and judicious of Watt's advocates, has said, "If he (Cavendish) had even stated in the detail of it that the airs were *converted*, or *changed*, or *turned* into water, it would probably have been enough to have secured to him the credit of this discovery as well as to have given the scientific world the benefit of it in the event of his death before he could prevail on his modesty to claim it in public."—*Edinburgh Review*, vol. 87, p. 125.

The evidence which this distinguished critic and judge regarded as sufficient to establish Cavendish's claim is now afforded, not by a note in his private Journal, but by the testimony of the zealous friend of Watt, who states that it was communicated to Priestley towards the end of 1782, that is to say, several months before Watt drew his own conclusions from Priestley's bungling repetition of Cavendish's experiments. It was, moreover, published to the world and suffered to remain uncontradicted while all the parties were alive and in frequent intercourse with the author and with each other.

Mr. Bennett has felt it to be his duty as executor to the late Mr. Brown to communicate the foregoing particulars to the President of the Royal Society, by whom they have been laid before the Society.

It is a remarkable fact that notwithstanding all the researches made on many occasions during the past half century on the claim to the Discovery of the Composition of Water, and even within the past year by eminent *savans*, the evidence published by De Luc, in 1787, remained undiscovered, with an exception, that being as above mentioned, the late Robert Brown, Esq., and this is the more remarkable when we remember that De Luc's chapter, already referred to, is especially devoted to anecdotes on the subject in question.

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*New Method of Preparing Sulphurous Acid.** By E. F. Anthon.

The author placed

2 ounces of sulphur in fragments, and
25 ounces of concentrated sulphuric acid

into a glass flask, furnished with a gas tube, and heated it over a spirit-lamp. The sulphur soon melted, and in a short time there was an evolution of sulphurous acid which was conducted into water. The evolution was very uniform, and the burning of the spirit-lamp was continued until, after about six hours, there was only a comparatively small residue in the flask.

During this treatment the sulphur constantly floated in the form of a transparent hyacinth-red, thickly fluid mass on the hot sulphuric acid, and a small portion of it sublimed; part of this condensed again in drops upon the walls of the flask, and flowed back into the acid, whilst another part was deposited in the form of a thin crust in the neck of

* From the London Chemical Gazette, No. 105.

the flask. Very small quantities of sulphur were carried further mechanically by the sulphurous acid, and deposited in the conducting tube, and the water placed to absorb the gas.

After the conclusion of the process the flask contained only

4½ drachms of sulphuric acid, and
32 grains of unaltered sulphur.

The advantages of this process are:—

1. That it furnishes a pure product;
2. That it is easily effected, and cheap;
3. That the evolution of sulphurous acid gas is very uniform, the reason of which is that the sulphuric acid always acts only upon the outer surface of the melted sulphur, and this always forms a coherent mass; and
4. That no solid deposit settles to the bottom of the vessel of evolution, which, in other methods, so often occasions the cracking of the vessel.—Dingler's *Polyt. Journal*, cl. p. 379; and *Chem. Centralblatt*, Feb. 2, 1859, p. 78.

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*Rapidity of Thought or Nervous Action.** By M. Ule, Revue Suisse.

The method of transforming the valuation of time into space by the rapid revolution of a cylinder, proposed by Mr. Fizeau, has been applied to the measurement of the rapidity of nervous impulse. Such a cylinder rotating 1000 times a second, and divided into 360 degrees, may measure 1-360,000th part of a second; or rotating 1500 times a second, 1-540,000th part of a second; and even this may be subdivided by a microscope, so as to obtain the 10-millioneth, or perhaps 100-millioneth part of a second. By this extreme minuteness of subdivision of time, it is not difficult to measure even the rapidity of a nervous impulse. If an electric shock be given to the arm, it produces a sensation and a contraction of the muscles. Hence, by noting the interval of time between the shock and the contraction, the time occupied by the transmission of the sensation and the action of the brain, however quick, will be determined. By trying the experiment with different parts of the body, sensible differences have been observed, the shock applied to the thumb being one-thirtieth of a second behind that applied to the face; and this difference pertains to the transmission and not to the action of the brain, and hence enables us to eliminate the latter in the experiments. In this way it has been found by M. Helmholtz, by whom these experiments have been made with the most care:—1. That sensations are transmitted to the brain at a rapidity of about 180 *feet per second*, or at one-fifth the rate of sound; and this is nearly the same in all individuals. 2. The brain requires *one-tenth of a second* to transmit its orders to the nerves which preside over voluntary motion; but this amount varies much in different individuals, and in the same individual at different times, according to the disposition or the condition at the time, and is more regular the more

* From the Edin. New Philosophical Journal, Oct., 1858.

sustained the attention. 3. The time required to transmit an order to the muscles by the motor nerves is nearly the same as that required by the nerves of sensation to pass a sensation; moreover, it passes nearly one-hundredth of a second before the muscles are put in motion. 4. The whole operation requires one-and-a-quarter to two-tenths of a second. Consequently, when we speak of an active, ardent mind, or of one that is slow, cold, or apathetic, it is not a mere figure of rhetoric.

Uniform Diapason.

A committee was appointed by the French Government in 1858 to examine into the expediency of establishing throughout France a uniform pitch or tone for the regulation of musical instruments. On the report of this committee made by M. Halevy, the composer, a decree has been issued by which a uniform diapason has been created for all the musical establishments in France, Imperial and other theatres in Paris, and in the departments, conservatories, succursal schools, and public concerts authorized by the Government. The *la* (a') corresponds to 870 vibrations per second. It is to be called the Normal Diapason.—*Cosmos.*

The diapason adopted by the *Congres Scientifique* held at Stuttgard in 1834, was *la* (a')=880. This movement is therefore towards lowering the concert pitch. Savart gave as the diapason of the opera at Paris in 1834, $la = 886\frac{8}{15}$. Another diapason given by M. Scheibler as that of the Academy of Music at Paris in the same year was 867·5. The starting point will now be $c = 1{\cdot}01953125$. And the gamut will be as follows:—*ut* (c') = 522. *re* (d') = 587·25. *mi* (e') = 652·5. *fa* (f') = 696. *sol* (g') = 783. *la* (a') = 870. *si* (b') = 978·75. *ut* (c'') = 1044.

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*Use of Words.**

A score of years ago there was talk about *endosmose* and *exosmose*, the gradual escape of gases through the barrier which ought to have kept them apart, and mixture with each other. These things exist in language: scientific words creep into common life, and *vice versa*:—*vice versa* itself is an instance. We know from Walter Scott and others that the sonorous word *meridian* came into Scotland to signify a dram taken at noon. We have recently found in an eminent man of the seventeenth century, no less a person than Huyghens, a proof of the universality of twelve o'clock as the dinner-hour in the seventeenth century. Speaking of the well-known method of double altitudes, he describes it as done by equal altitudes of the sun before and after *dinner*, a sound which he must have held to mean noon as to time, whatever it meant as to substance. It is much to be regretted that men of science never allow the long words to be corrupted down into something easier; what

* From the Lond. Athenæum, Feb., 1859.

a pity that they cannot hand them over to the vulgar to have the corners knocked off, since they will not take their terms out of our own language. To this day they cannot speak of the two parts of a fraction under nine syllables, *numerator* and *denominator*, which are always coming together, and make as much rattle as a cab driving up to the door. By a rough computation, we find that the amount of superfluous muscular contraction employed in speaking of fractions by all the mathematicians of Europe since the invention of printing, would, collected into one effort, have set the *Great Eastern* afloat, and carried her nearly three miles beyond the Nore! Why not cut these rattling polysyllables down into *numer* and *denomer*, pleasant and easy sounds? So much to the arithmeticians on one point: as Whiston said to Queen Caroline, when they have mended this fault, we will tell them of another.—*London Athenæum, Feb.*, 1859.

A New Silk-Worm.

M. Guerin-Meneville, announces to the Academy of Sciences, that he has succeeded in naturalizing in France a new variety of the silk-worm from China, which lives upon the leaves of the Ailanthus. He speaks of the silk as equal in quality and superior in quantity of that from the worm of the castor-oil plant, or even of the mulberry.

Might it not be worth while to some of our more enterprising farmers to endeavor again to introduce among us this most important branch of manufacture, which appears to have failed before, chiefly from becoming the object of a wild speculation? The ailanthus grows freely in this climate, and is much sought after in our cities as a hardy shade tree.

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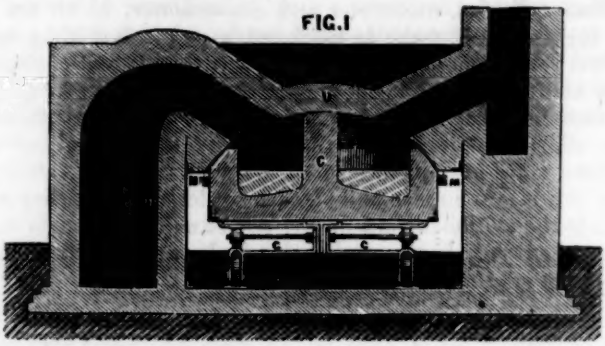
*Improved Furnaces for Manufacturing Iron.** By Jos. Maudslay.

Every engineer knows that immense expense is incurred in the manufacture of those large masses of wrought iron which have to be used for certain parts of steam engines for which ordinary cast iron cannot, with security, be employed. After many years' experience, especially in connexion with the manufacture of large marine engines for the Admiralty, Mr. Joseph Maudslay, of Lambeth, has instituted experiments with the view of producing an iron which should possess but little less strength than wrought iron, and at the same time be susceptible of being cast in moulds to the forms required; and he has been, to a very great extent, successful. The apparatus by which he effects his object is a rotating furnace moving about an inclined axis, as illustrated in figs. 1 and 2 of the annexed engravings, of which fig. 1 is a longitudinal vertical section, and fig. 2 a transverse vertical section through the bed of the furnace. C is the inclined bed of the furnace, which is made to revolve about an inclined axis; D, an arched cover above the furnace, which cover is supported by a fixed iron frame, or casing; E, the door through which the furnace is charged with metal; F, a tapping-hole through which the me-

* From the Lond. Mechanics' Mag., Jan., 1859.

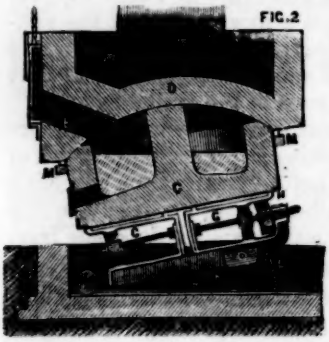
tal is run off; G, a roller frame, upon which the bed of the furnace revolves; H, a bevel pinion gearing into the teeth of the wheel for giving motion to the revolving bed; K, a lower frame furnished with wheels,

FIG.1



by means of which the revolving bed, after being lowered by the screw L, may be withdrawn from beneath the arched cover for repairs or otherwise. The wheels of the lower frame run upon rails, R; M is a sand-joint for preventing the access of cold air into the furnace between the fixed top and the revolving bed; N is the flue leading to the chimney. The arrangement of the furnace above described is the best with which the inventor is at present acquainted for carrying his invention into effect, but he does not limit himself to the details thereof, as they may be variously modified.

FIG.2



By keeping the metal stirred about for some time whilst in its molten condition, by means of the rotating furnace, the sulphur and other impurities contained in it are allowed to readily fly off, so that the apparatus answers, in some measure, the purpose of a puddling furnace, and leaves the metal itself in a semi-puddled state, somewhat approaching the condition of wrought iron, but still with sufficient fluidity to allow of its being run into moulds and used for many purposes for which wrought iron is at present employed.

The axis of the improved furnace is placed by preference about 10° out of the perpendicular.

On the Melting and Solidification of Water.

M. Mousson reports in the *Bibliotheque Universelle de Genève*, an interesting set of experiments made by him for the purpose of determining the effect of pressure on the melting point of ice.

He first exposed a number of capillary tubes of diameters varying from 0·0074 inch to 0·1 inch, and containing columns of water about 12 inches long, to the air. The exposure lasted seven days, during which

the temperature never rose above 28·5° Fah., and went down every night below 23° Fah. Upon withdrawing the tubes, all those whose diameter was greater than 0·36 inch had frozen; and all those whose diameter was less than 0·275 inch had remained liquid, nor did a sudden blow cause them to freeze. By arranging the tubes in an inclined position so as to plunge them in a vessel of water, it was found that the formation of the ice externally, favored their freezing. The two tubes of least diameter (0·013 and 0·0074 inch) alone remained liquid.

The sheet of water between two plates of glass pressed together by screws, will not freeze; but if they be simply laid on each other, the sheet which is then thicker, will freeze.

Blocks of ice from 3 to 4·5 inches cube were placed in a hydraulic press and reduced to sheets of a few hundredths of an inch in thickness. Although the temperature of the air was only a few degrees above the freezing point, the water trickled from the blocks on all sides.

In order to prevent the expansion of the water during freezing, a quantity was introduced into a cylindrical cavity of about 0·24 inch in diameter, in a heavy prism of wrought iron. The water in the cavity was compressed by a powerful screw, and then exposed to cold. The water remained liquid at 26·6° Fah. In an attempt to reduce the temperature to 23° Fah., the apparatus began to leak.

A quantity of water was then introduced into a cavity in a similar prism of steel, and after being frozen, the ice was compressed by means of a powerful screw moving a copper cone. The apparatus was surrounded by a freezing mixture, the temperature of which varied from —0·4° to —6·7° Fah.; the temperature of the air was below 32°, and the movement of the screw was performed so slowly as to make but two turns, (or forward motion) of 0·36 inch in four hours. The ice was liquified by the pressure, as was indicated by the position of a small wire index which had been frozen into the mass.

The pressure to which it had been exposed was 13,070 atmospheres, by which the freezing point was reduced below 0° Fah.

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*Can a suitable Insulating Material be found Possessing a Lower Specific Inductive Capacity than Gutta-percha?** By E. O. Wildman Whitehouse, Esq.

The amount of induction and consequent retardation in submarine wires—other conditions being alike—would seem to depend so greatly upon this property of the insulating sheath, that it would be most desirable that some experiments should be made with the object of determining this point.

A substance, or rather solution or compound, suggested by Mr. Statham, and recently perfected and adopted at the gutta-percha works —with which the wire is coated, before it receives the gutta-percha— will be found, if I mistake not, to be a step in this direction, while at the same time it enhances largely the perfection of the insulation.

It still might be an object of legitimate research to discover some

* From the London Mechanics' Magazine, October, 1858.

substance of very low specific inductive capacity, which shall possess all the mechanical and chemical properties requisite for this purpose. —*British Association*, 1858.

Curious Phenomena in Yellow Glass.

Mr. Ponting, in a letter to the London Photographic Society, states that he has used in the windows of his laboratory, panes of glass colored yellow by oxide of silver for five years without perceiving any change in their optical properties, until a week before the date of his letter, when he found that they had suddenly ceased to intercept the chemical rays. By careful comparison with others, he could not find that their color had perceptibly changed. *Cosmos*, *Oct.* 1, 1858.

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*Application of Photography to Wood Engraving.** By R. Hunt.

Numerous experiments have, from time to time, been made to produce photographic pictures upon box-wood blocks, of such a character that the wood engraver would be enabled to work upon them. Hitherto success has not attended these efforts; but from some examples which we have lately seen, there is every reason for supposing that the desired end will shortly be accomplished.

It should be understood that there is not the slightest difficulty in producing very perfect photographic pictures upon box-wood blocks. Even by applying the nitrate or the chloride of silver to the surface of the wood, very satisfactory photographs could be obtained; but the difficulty in this case is that the silver salt gives a brittleness to the wood, and it is liable to "chip off" under the tool; hence it is not possible to produce fine lines.

By coating the wood with albumen this has been avoided, but the wood engraver complains of the presence of the film of albumen preventing him from working with his usual facility. This objection is, however, almost entirely overcome by the use of collodion, the attenuated film offering scarcely any obstruction to the engraver's tool. All that is necessary is, to adopt one of the so-called dry collodion processes, and to obtain from a good negative on glass a positive copy on the block. It is important that the processes should be simplified as much as possible, to avoid all risk of injuring the wood. It is well to coat every part of the wood, except the face, with a thin layer of a transparent varnish, so that the iodized collodion may be applied, and the *face* dipped into the solution of nitrate of silver, without the risk of having any absorption. Again, in the slight fixing process which is necessary, no very high degree of permanence being required, this varnish also protects the wood. By employing a somewhat sluggish collodion process, very charming pictures may be easily obtained and rendered sufficiently permanent.

Now arises the wood engraver's difficulties. He has been trained to cut along certain well-defined lines, and he does not understand working upon a drawing in which there are none of those lines. It is, however, merely a question of education; the conventional system must

* From the London Art Journal, January, 1859.

be abandoned; and the engraver must be taught to use some judgment in the execution of his work. It has been proposed that practised draughtsmen should be employed to indicate, by lines on the photograph, where the wood should be cut. This would be still preserving the same mechanical system which at present exists. Something beyond this is required, and a class of engravers must be educated to work directly from the photograph, without any adventitious aid. We have before us a representation of an amphora, photographed on wood, and engraved by Mr. G. R. De Wilde, of Clerkenwell, which is, in itself, an admirable example of what may be done. This wood-cut shows that no real difficulty exists in the production of photographic pictures upon box-wood blocks, which may be cut, and from which very beautiful impressions may be obtained.

The advantages of such an application are manifold. The truthfulness, in the first place, is one of its greatest recommendations; and for objects which have any relation to science, this is paramount to every other consideration. The rapidity of production is another advantage, since it would enable authors and publishers to be far more liberal in their illustrations than they can afford to be at present.

At this time we have wood engraving advanced to a high degree of excellence, and we very justly admire the results; but if we could at once transfer to the wood the copy of a negative on glass, which represented some scene of sacred or historic interest, how much more satisfactory would it be to all. We know that the wood engraver is supplied with photographs of machinery and other objects, which he copies with great labor, by the pencil, on the wood. The same photograph on the wood should be at once available; and instead of the pencil, the wood-cutter should be instructed to use the graver. The perfection of such reproductions, as it regards the relative dimensions, distances, &c., and the correctness of all the details, would be unfailing recommendations. We learn that the wood engravers of Germany are now availing themselves of photography to a considerable extent; and we hope we shall not be long before we have to refer to English examples of this most useful application of a very beautiful art.

Saponification of Fats by Chloride of Zinc. By LEON KRAFFT and TESSIE DU MOTTAY.

"When any neutral fatty matter is heated with anhydrous chloride of zinc, we see it melt and disappear gradually as the temperature rises. Between 300° and 400° (Fahr.,) the mixture of the two bodies is complete. If the temperature be maintained for some time, and the mixture be then several times washed with warm water, or better, with water acidulated with hydrochloric acid, we obtain a fat which, when submitted to distillation, gives the fat acids which correspond to it, and with an insignificant production of acroleine. The wash-waters carry off almost the whole of the chloride employed, so that by evaporation this may be again used for another process. The fat acids are thus produced in as great quantities as by the common methods, and

have the same appearance, the same qualities, and the same fusing-point as those which are obtained after saponification by sulphuric acid. To operate well and quickly, the mixture should be heated rapidly until by the reaction of the two bodies on each other, which is of considerable violence, the vapor of water is abundantly evolved."

"In fact, the washing with acidulated water may be dispensed with; but the products then obtained by distillation are softer. If, however, the distillation be carried on by means of a current of superheated steam, this defect may be in a great measure cured. In all our experiments, the use of superheated steam produced the products more rapidly, more firm, and less colored."

The experiments were instituted with a view to allow the inhabitants of South America, to convert their fats into stearic acid, without the danger and expense of transporting sulphuric acid to those countries. In an economical point of view this problem is resolved, since the chloride of zinc is sold at Marseilles never higher than 2¼ cts. per pound, and packed in cases or barrels can be shipped without danger or inconvenience.—*Comptes Rendus de l'Academie des Sciences, (Paris).*

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, April 21, 1859.

John Agnew, Vice President, in the chair.

John F. Frazer, Treasurer, present.

Washington Jones, Recording Secretary, P. T.

The minutes of the last meeting were read and approved.

A letter was read from the Royal Society of London.

Donations to the Library were received from the Institute of Actuaries, and the Chemical Society of London; La Société Industrielle du Mulhouse, France; the Lower Austrian Mechanics' Association, Vienna, Austria; the Smithsonian Institution, Washington City, D. C.; the Mercantile Library Association, St. Louis, Missouri; H. Bailliere, Esq., City of New York; the Mercantile Library Association, Brooklyn, New York; the Long Island Railroad Co., New York; the Ohio Mechanics' Association, Cincinnati, Ohio; the State of Pennsylvania; Dr. T. B. Wilson, Prof. John F. Frazer, T. S. Stewart, Esq., Prof. F. Rogers, Prof. B. H. Rand, Prof. J. A. Meigs, and George M. Conarroe, Esq., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement for March.

The Board of Managers and Standing Committees reported their minutes.

The Board of Managers reported that Uriah A. Boyden, Esq., of Boston, Mass., has deposited with the Institute $1000, which he requests the Institute to award to "such person as shall, by researching in North America, prove to the satisfaction of the Institute, whether

all the rays which may be known, have or have not equal velocities of transmission."

The Board of Managers have, on the recommendation of the Managers of the Sinking Fund and Finance, accepted the Trust, and have appointed a special Committee consisting of Professors John C. Cresson, John F. Frazer, and Alex. Dallas Bache, to define the terms of the premium; and the Board now report their action in the case, and ask the sanction of the Institute.

On motion of Mr. C. B. Rogers, it was

Resolved—That the Franklin Institute sanction the action of the Board of Managers in the subject of the prize proposed by Mr. U. A. Boyden.

The Actuary reported that the following Standing Committees have organized by electing their Chairman, and appointing their times of meeting:—

Committees.	*Chairman.*	*Meetings.*
On Models,	Wm. B. Bement,	2d Monday evening.
" Meteorology,	Prof. J. A. Kirkpatrick,	3d Friday "

Candidates for membership in the Institute (5) were proposed, and those proposed at the last meeting (3) were duly elected.

Mr. J. E. Wootten presented his patented design for gauge-cocks intended to indicate the exact height of the water in steam boilers. It resembles somewhat that invented by Mr. Tyler, but has some additions and improvements. A full description with a cut will be given in the *Journal of the Franklin Institute* for June.

BIBLIOGRAPHICAL NOTICE.

Journal of the American Geographical and Statistical Society. 4to. monthly, pp. 32. Published for the Society by John H. Schuttz & Co., 9, Spruce St., New York.

The American Geographical and Statistical Society of New York, is one of our most flourishing, as it is one of our most deserving scientific bodies. We have always read with great interest the imperfect report of their proceedings as published in the daily papers, and have preserved, as of great value, many of the communications which have been made to them on the subject of geography, especially that of our own continent.

We are glad to find that they have determined to publish a Journal in which these valuable materials will be hereafter preserved in an accessible form. The two numbers of this new publication which are now before us, have a great number of very interesting articles on a variety of subjects, kindred to the purposes of the society, illustrated by maps and tables; and the manner in which they are presented to the world is creditable to the Society and to the publishers.

We strongly recommend this Journal to the notice of those of our subscribers who are interested in geography and statistics.

ED. F. I. J.